

Osprey AutoHistory

CITROËN SM

2.7litre V6 Maserati engine

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Chapter 1

By determination out of confusion

Few cars have achieved classic status quite as quickly as the Citroën SM. There is every reason, for it was expensive, technically ambitious and relatively few were built. Production was stopped at the very moment—as many enthusiasts saw it—when it was finally beginning to establish itself in the face of all difficulties. That this was not really the case, as will later become clear, can no longer affect its present-day appeal to the collector and investor.

The SM was born of several trains of thought. First, there was the constant desire of Citroën to build a true GT car, a desire nurtured through the pre-war years but frustrated afterwards. The second was the feeling that Citroën's own ambitions apart, France needed a true prestige car and none of her other manufacturers were likely to make one. Renault were too occupied with building middle-market saloons; Peugeot were too conservative; Simca nestled beneath Chrysler's wing and were in no mood to build anything exotic. Finally, there was the need to justify what appears in retrospect to have been the rash purchase of Maserati in 1968.

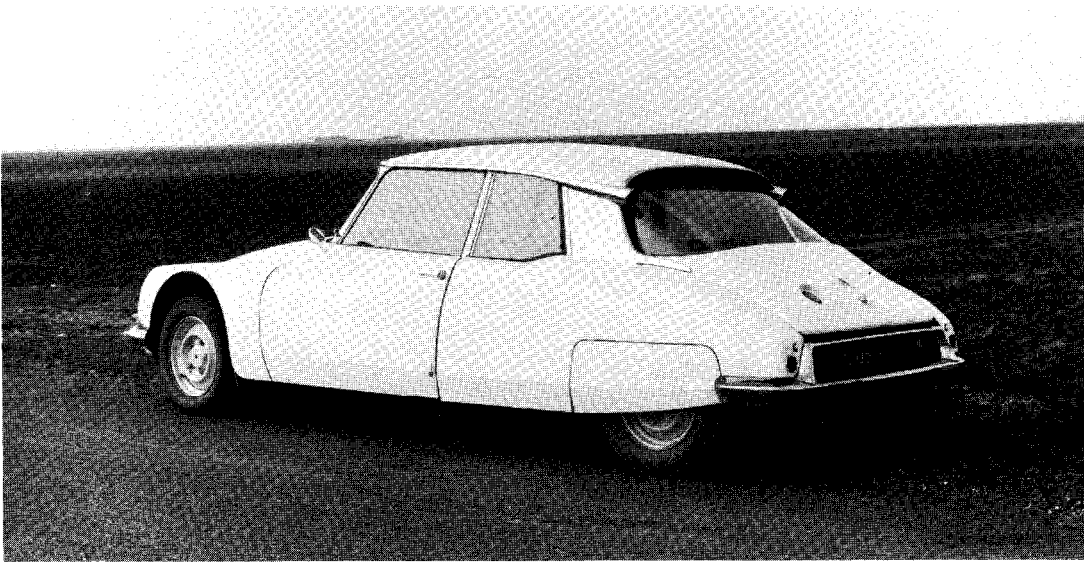
There was something of an established tradition of sporting Citroëns running from the Caddy models of the 1920s, but the first attempt to upstage the world was the 22cv V8 Cabriolet, first

Opposite Citroën's standard tool for high-performance development during the 1960s was the 'cut-and-shut' DS. Here two V6 powered cars, one very early example with the original headlamp layout and rear-wing bulges for SM tyre clearance, leads a later shark-nosed prototype in a road driving exercise. Note that in both cars, the front wheel arches are cut away to clear the wider tyres on full bump and lock

BY DETERMINATION OUT OF CONFUSION







seen at the 1934 Paris Salon. It evoked a lot of interest, as well it might, because it used front-wheel drive at a time when the world had only had a few weeks to get over the first shock of the *traction avant* saloon. Sadly the car never went into production, and only twenty examples were ever made. Difficulty with the engine is usually quoted as the reason, and it is true that some cars ran with 221 cubic inch Ford V8 slave units to prove the transmission and chassis; yet the engine should have been simple enough to develop, consisting essentially of two of the familiar 1911cc in-line 'fours' spliced together at right angles. Whatever the engine problems, it seems likely (and present opinion at Citroën agrees) that the most formidable obstacles were encountered in trying to cope with so much torque and front-end weight when front-wheel drive was in its infancy. Be that as it may, Citroën would certainly have had the demise of the V8 very much in mind when they came to plan the SM.

Above Study of this V6 powered prototype (the rearmost of the two cars seen on page 7) shows the reshaped rear wings to cover the SM-type suspension, four exhaust pipes, and the fuel filler cap recessed in the boot lid

Left Apart from serving as development tools, the DS 'coupés' were run in the prototype class in several rallies during the 1960s. The virtues of the Citroën suspension were rarely more apparent than in one famous incident when the car continued to the end of the stage despite losing a front wheel

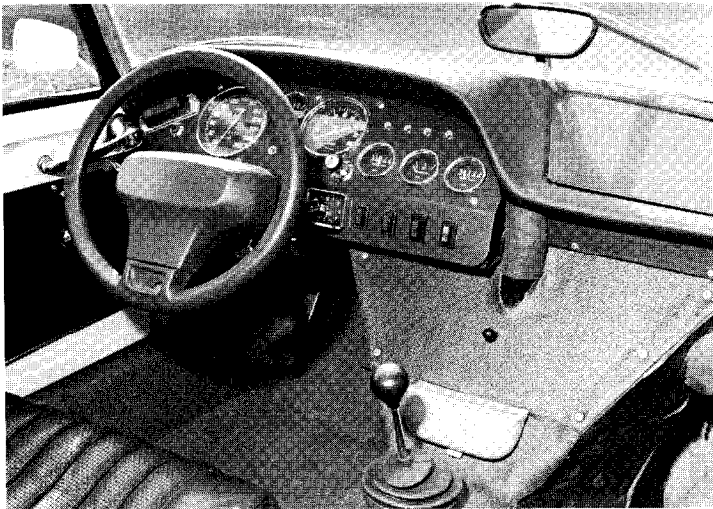
Failing the V8, pre-war Citroën turned instead to the 2.9-litre straight six, which posed fewer problems and was used with success in the 15cv models. The six-cylinder cars continued after the war—*The Autocar* published road tests in 1949 and 1953—but the engine died with the introduction of the DS although there had been rumours of a flat-six replacement. This is not the place to go into the furore aroused by the DS, except to note two things: first, that there was constant expectation of bigger-engined versions, and second that the lessons learned in service with the DS high-pressure hydraulic system left no doubt that it should be adopted for the SM.

Although the DS was indeed made more powerful over the years, including the often-overlooked arrival of a completely new series of engines in 1966, it was never given more than four cylinders. Eventually, in fuel-injected 2.3-litre form, it showed remarkable performance, yet it remained a familiar and roomy saloon car. Thus it added insult to injury when it cruised past more sporting machinery on the *autoroutes*. The DS spurred the coachbuilders to great efforts, though none of them could do much about the mechanical side. Citroën meanwhile experimented with several cut-and-shut two-door DSs, some of which ended up as hacks for the competition department.

Meanwhile, on the management side, Citroën was undergoing an almost continuous traumatic experience. To say the company was stretched is putting it mildly. It had expanded by takeover, buying the Nanterre works from Simca, then swallowing Panhard and Berliet in turn. In the midst of all this there were plans to plug the glaring gap in the range between the flat-twin Ami and the DS, a project which came to fruition as the GS; and the association with NSU to develop and put into production a range of



Above The plumbing nightmare of the V6 and all its accessories was evident as soon as the engine was installed in the DS nose. This is a typically prototype mess, but the basic SM layout did not greatly differ



Left The V6 DS was obviously a prototype inside as well though the more functional instrument panel might have been better appreciated by some SM owners than the final, heavily styled version



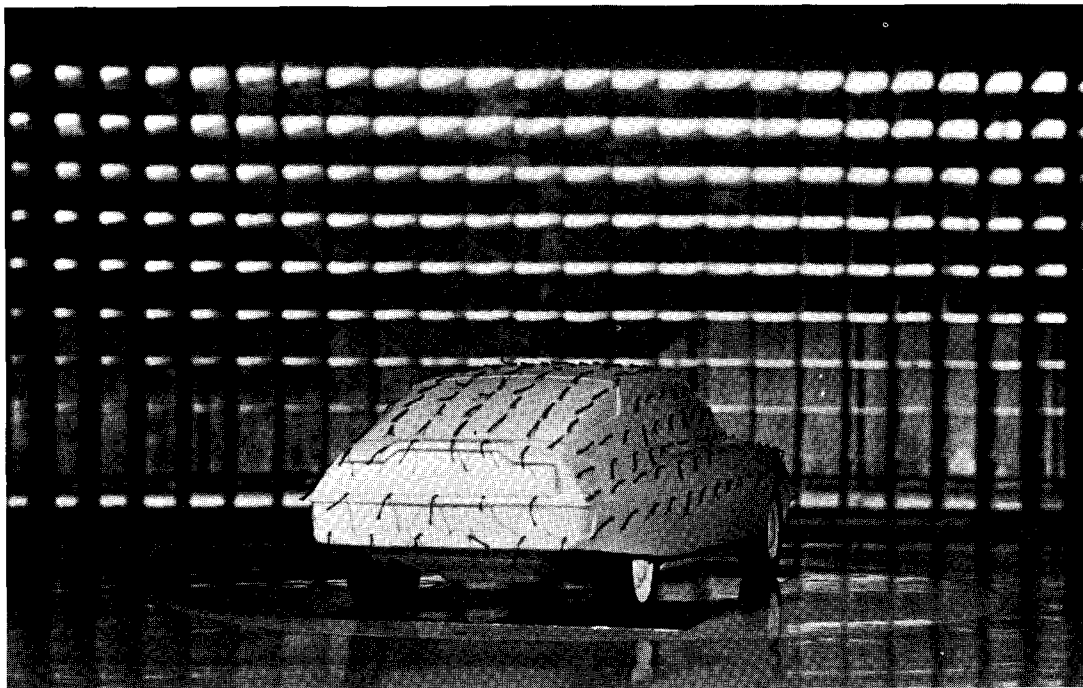
Wankel engines for the small and mid-range cars. In the slightly longer term there was the clear need to build a major new factory on the outskirts of Paris and move production out of the jumble of elderly buildings behind the Quai Andre Citroën. All this was on top of the considerable investment in the Rennes factory, which was to be the GS assembly plant.

The company sought strength in a form of merger with Fiat, a move foredoomed to failure because there was no real intention to give the Italian company very much in return for its support. Fiat were allowed only 49 per cent of the joint holding company, Pardevi: they stuck it for five years and then pulled out, leaving Citroën an over-heavy burden in the hands of its longer-term parent, Michelin.

Amidst all these moves, the development of the SM went ahead with remarkable speed and determination. The speed of its progress may be judged from the fact that Citroën absorbed Maserati early in 1968, and that the SM was presented to the press at the Geneva Salon of March 1970. This argues a development time of under two years for a car which was accepted as a technical *tour de force*, and certainly explains why the SM was not actually offered for sale in France until August 1970. The Geneva cars were not built on production tooling.

It would be wrong to say that Citroën took over Maserati merely in order to obtain an engine and production facilities for the SM. There were several reasons for the Maserati takeover. In part it was probably residual inertia from the expansion of earlier years, and it was certainly regarded as a gesture of co-operation with the Italian industry and therefore one of the planks on which the Fiat deal was laid. Nor could it be denied that Maserati had major attractions as a prototype

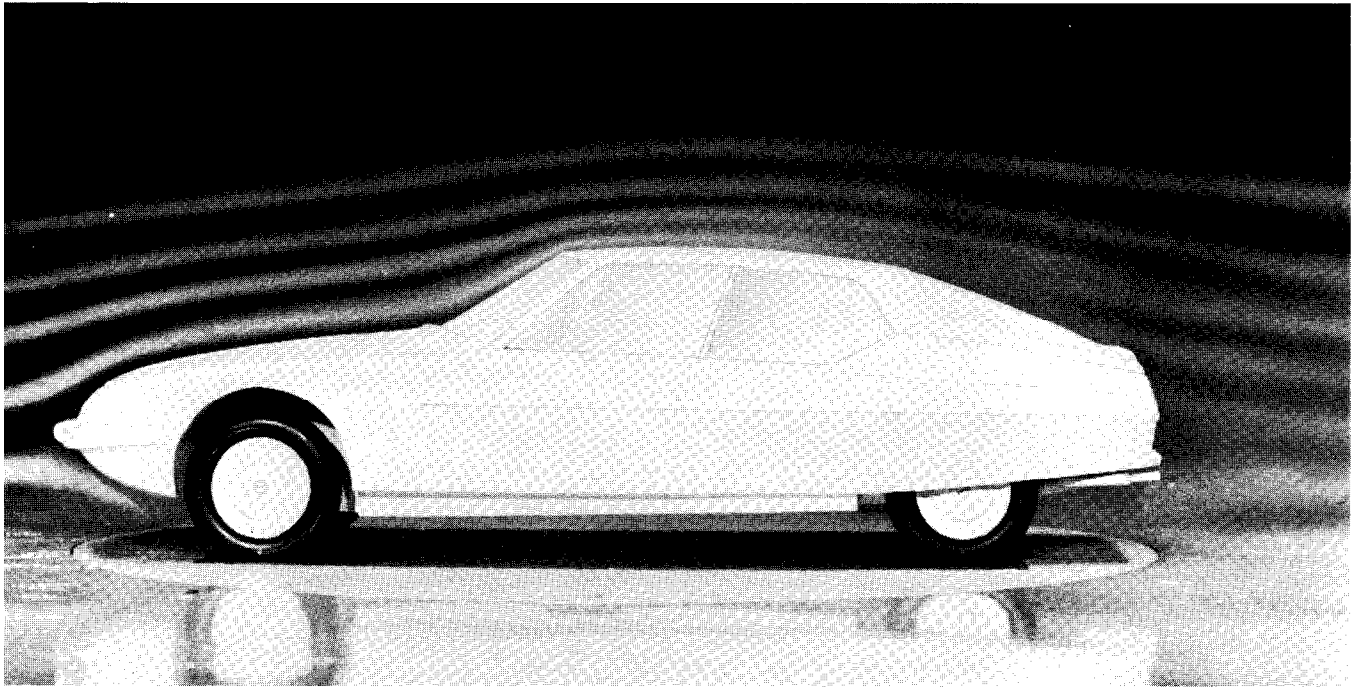
Opposite Maserati's Ing. Alfieri chopped up the V8 Indy engine to produce the prototype V6 in a matter of days rather than the anticipated weeks, and met Citroën's power requirement with ease. His aim was to encourage Citroën to use Maserati on a large scale as a research and development organization



Wind tunnel shot of a wool-tufted SM scale model shows good attachment of the boundary layer over the rear window, one of the secrets of the car's low drag coefficient; more surprising is the marked downward flow in the region of the rear pillar. Note the detailed fuel tank under the model's tail: Citroën try not to 'cheat' in tunnel tests

and development shop, not just for the SM but for much future work. Its potential was amply proved by the work done in building the SM engine.

It was not a new engine at all, but rather a clever adaptation of the 4136 cc Maserati Indy engine, the V8 to which the Italians had been looking to take over from their venerable straight six. There were very good reasons why the V8 could not be used as it stood: it was too big and too long. Citroën were totally committed to front-wheel drive, no doubt to Maserati's alarm, and the only practical layout was to follow the pattern of the DS, with the engine aft of the axle line and the gearbox forward of it. This gave the best balance, but demanded a short engine. The most-criticized feature of the DS was the way the rearmost of its four cylinders practically lived in the passenger



compartment, and a wider, higher-output engine was certainly going to have to be installed ahead of the main bulkhead.

The V8 was therefore shorn of two cylinders to make a V6, which made the nose merely long instead of impossibly long. It had the extra advantage of reducing the engine capacity. Citroën were hamstrung by the punitive taxation levied in France on any car with an engine capacity of more than 2.8 litres and it had been decided in principle that the SM would have a *puissance fiscale* rating of 15cv. This entailed further fiddling with the original Maserati dimensions.

Taking off a pair of cylinders reduced the V8 to 3102 cc, which was still too much. A new crankshaft was needed, of course, with its throws at

Smoke-stream pictures from wind tunnel tests can be made to prove almost anything if looked at out of context, but there can be little arguing with the clean shape of the SM here. The nose shape especially is near-perfect, though its stagnation point is higher than some of today's ground-effect theorists would accept



The SM in production form for Europe, with carefully faired-in headlamps and intakes for cooling air (some of it ducted to the inboard front disc brakes) beneath the bumper. Only the front wheel arches, and the unfortunate driver's door mirror, spoil what is otherwise a remarkable low-drag shape

120-degree intervals (the big ends being paired on the crankpins), and as part of its design the stroke was reduced from 85 to 75 mm. That made the swept volume 2737 cc, still enough to push the V6 over the 15cv target, so the final measure was to reduce the bore by 1 mm to give a capacity of 2670 cc.

Ing. Alfieri was in charge of the development. Citroën had asked him to produce results in six

months, to which (no doubt with an eye to proving how valuable an asset Maserati could be) he had replied that he would show them an engine in three weeks. An Indy engine was quite literally chopped up to serve as the prototype, with suitable blanking plates to cover the gaps left by the missing pair of cylinders, a crankshaft machined from the solid and new camshafts. Sixteen days after his project-definition meeting with Citroën, Alfieri sent off three power curves, obtained with three different camshaft profiles, to Paris. The peak of the tallest curve was 200 bhp: Alfieri had been asked for 150 bhp.

That was not the whole story, for it remained to re-engineer the power unit to be installed as it were the wrong way round, to mate up with the Citroën transmission. In particular, all the accessory drives (including the camshaft drive) had to be changed. Citroën designed their own gearbox along the lines already established in the more powerful versions of the DS. That is, it was a two-shaft, five-speed box with all-indirect ratios, allied to a spiral-bevel final drive.

The various mechanical parts were assembled in prototype form and run in what appeared to be yet another of the DS Coupés already mentioned. It had a more up-to-date appearance than most, though, with the smooth nose profile and faired-in headlights of the last generation of DSs. Under its bonnet, as shown here, lurked the V6 engine. The adaptation was in many ways not difficult, because the SM drew heavily on systems proved by many years of DS service experience. Only the steering was wholly new, reversing the process: it was the SM that proved the VariPower system for the later CX. Discounting the steering, the SM could indeed almost have been described as a DS with more engine but less room inside, had anyone been sufficiently cynical; but nobody was.

Chapter 2

Franco-Italian technique

The SM body was styled 'in house' with, as one would expect, enormous attention being paid to aerodynamics. Models spent many hours in wind tunnels; Citroën make extensive use of French aircraft industry tunnels as well as their own. Once the basic shape had been frozen, the subsequent changes were subtle and had as much to do with stability as with drag reduction. Then as now, Citroën regard cut-and-try spoilers with distaste. The long nose was a tremendous help from the aerodynamic point of view, naturally, and in sideways view is an almost perfect entry curve with the front bumper at the natural stagnation point, where the airflow would in any case divide to go over and under the car. The nose undertray, following the lessons learned with the DS, is extremely smooth and runs aft as far as the front wheel arches. Above the bumper, the lights and licence plate holder are totally faired in—it pained Citroën engineers that in some parts of the world, notably the USA, such refinements were illegal.

Structurally the SM is massive, and today would certainly be built lighter. Nobody could doubt its strength, however, with the main body-box of floor, bulkheads, roof and rear wings welded into a whole. Heavy longerons run forward from the main bulkhead to a cross-member in line with the drive shafts, and continue to the front to provide the front suspension mountings.



Only the bonnet, the front panels, front wings (complete with inner wheel arches) and doors are bolted on. The whole impression is of a structure that was designed with more of an eye to strength than to elegance—that was left to the outward shape. Considering how quickly it was designed, that is not surprising. Weight apart, it looks (and

Rear view of European-standard production SM shows expensive double-curved rear window, also the exhaust layout finally adopted. Much of the rear panel, between the two half-bumpers, was formed of plastic transparency



American lighting regulations insisted on the use of four small circular headlamps. The SM for the US market thus emerged like this, losing not only the output of Cibie's superb European system but also the drag benefits of the front fairing

is) something of a nightmare to straighten and repair after major accident damage.

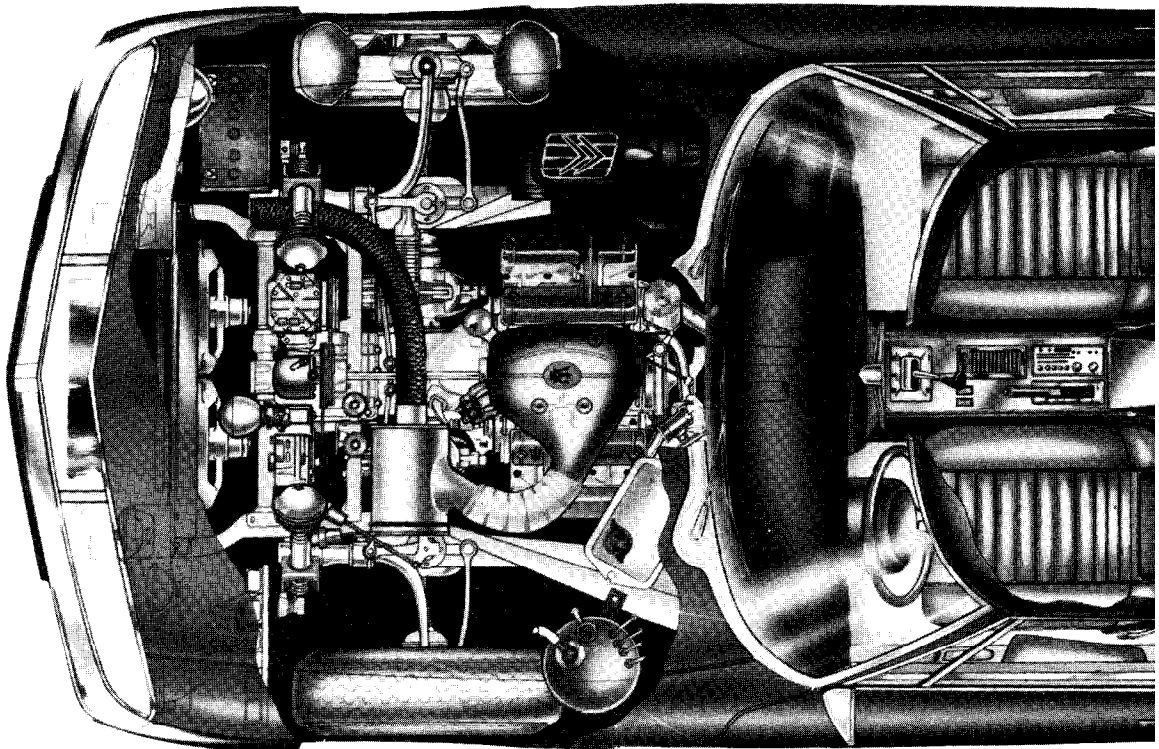
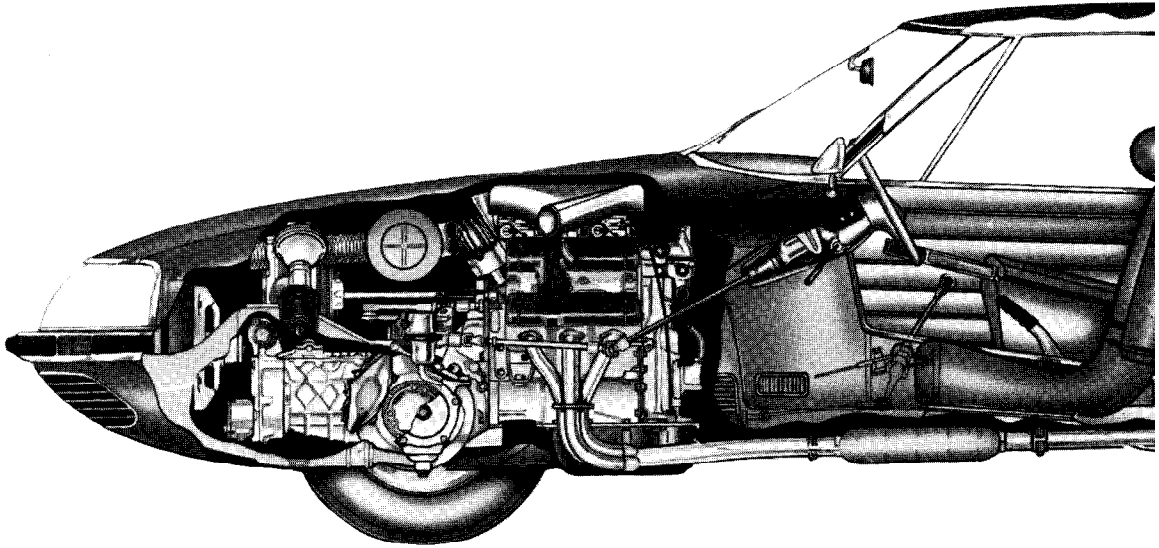
The shape of the back end strikes many observers as the most awkward part of the SM. It is a rather difficult compromise between the desire for a deep boot and the curving rear hatch with its large (and extremely expensive) double-curved glass. The result is an upsetting discontinuity in the car's waistline and an awkward fold above the

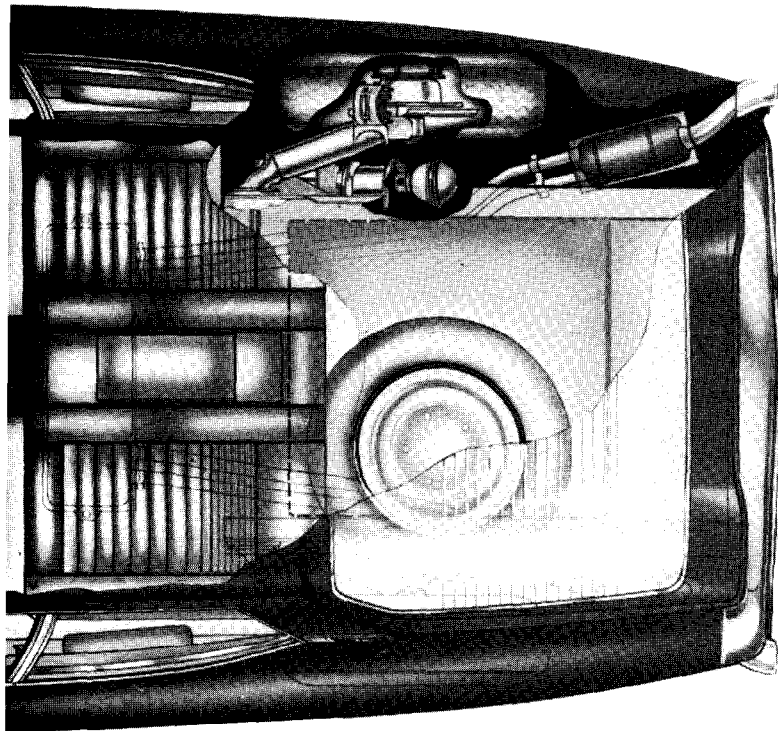
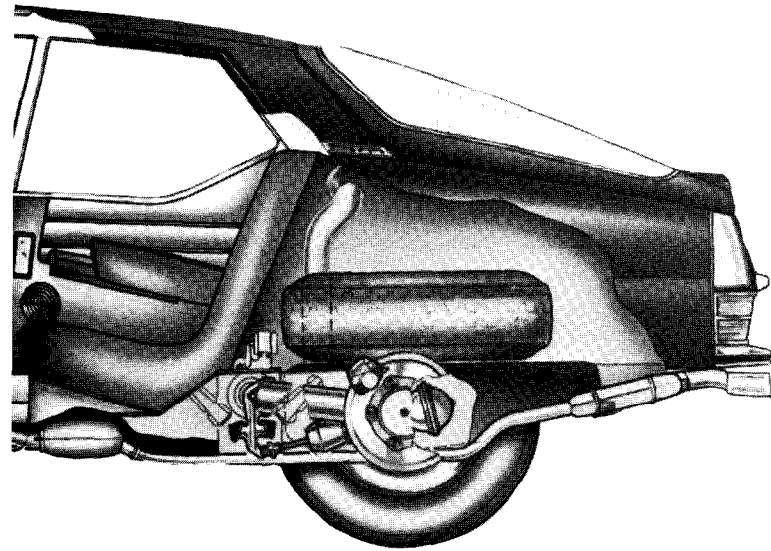


rear wheel arch. At the trailing edge of the hatch is Citroën's only concession to a spoiler, a small kick-up which keeps the boundary layer attached to the rear window, to the benefit not only of drag but also of rain clearance and wind noise.

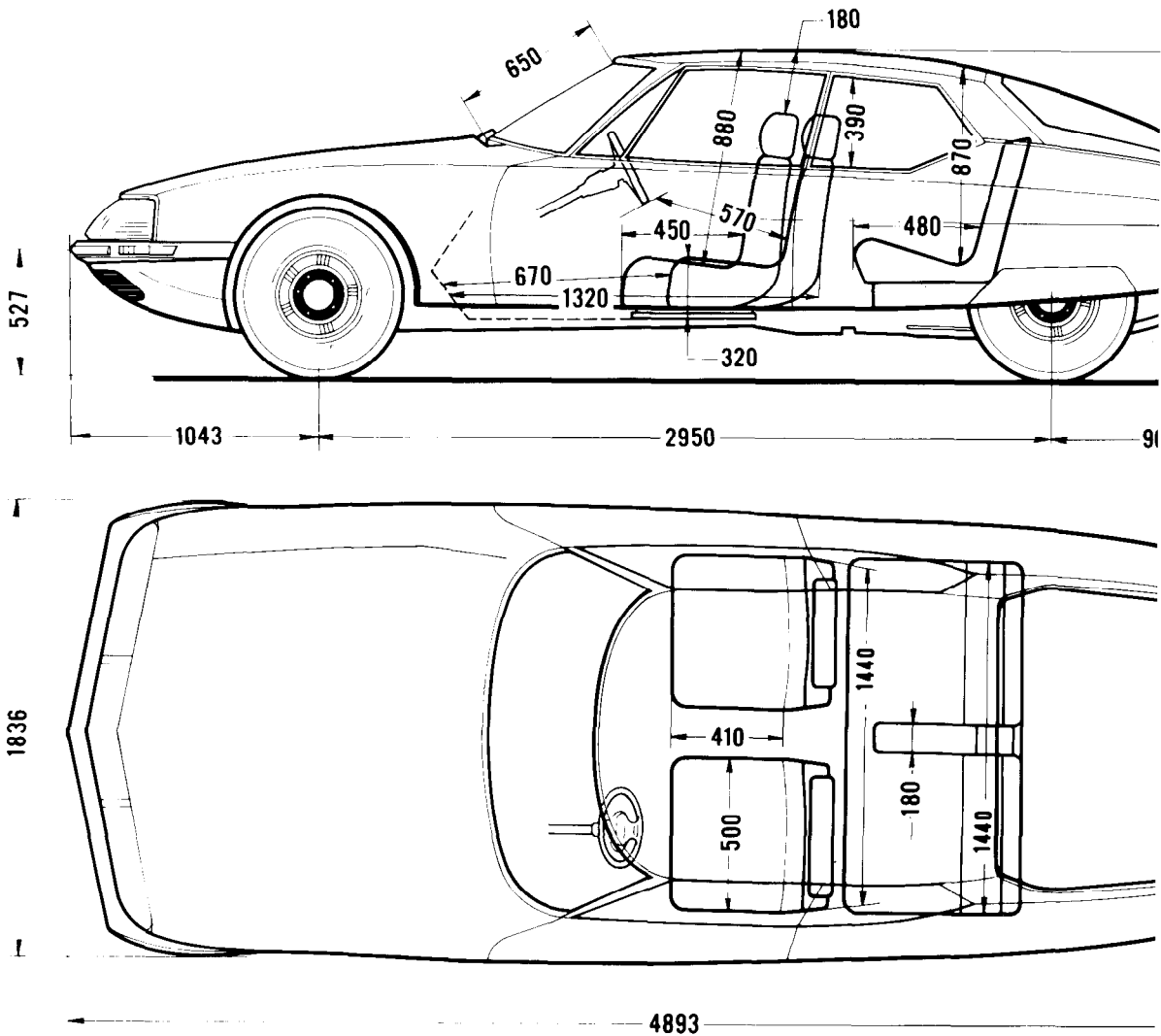
The DS had become famous as much for its high-pressure hydraulic system as for its looks, and it was natural that the SM design team should seek to take the formula even further. DS-type suspen-

American influence at the back of the SM was less damaging. The small kick-up in the trailing edge of the hatchback, though put there largely for aerodynamic reasons, provided useful area for housing the squat US-pattern number plate, lit from each side rather than above

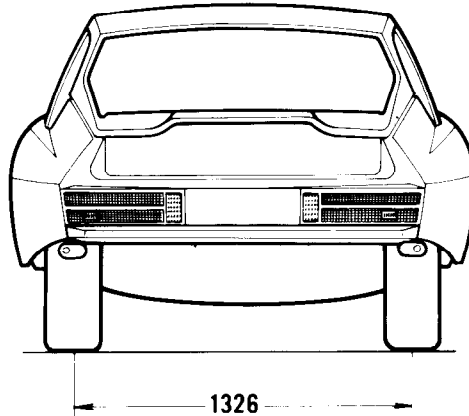
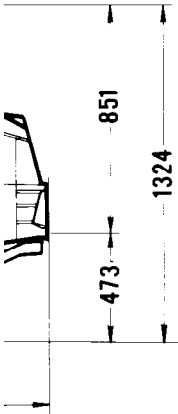




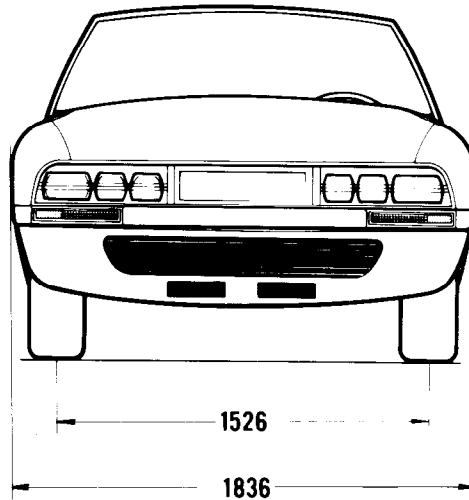
Citroën's official two-dimensional 'cutaway' of the SM released for the 1970 launch makes the car appear deceptively simple. Even so, the length of nose needed to accommodate the V6 engine forward of the main bulkhead and achieve a perfect aerodynamic profile is at once evident. So is the much narrower rear track which also resulted from a pursuit of the theoretically desirable 'teardrop' shape. Luggage space was sacrificed by having to stow the spare wheel on top of the big fuel tank. By comparison with the DS, let alone the later CX, the SM offered poor interior space by comparison with the car's external dimensions — but then, that was hardly the point of the exercise



sion was inevitable, together with the full-power brakes, but a new steering system was devised which also depended on the high-pressure supply. To make sure the hydraulic system had plenty of capacity for all its tasks, it was endowed with a very large fluid reservoir and a new type of multi-plunger swash-plate pump driven at half engine speed and backed up by a pressure accumulator



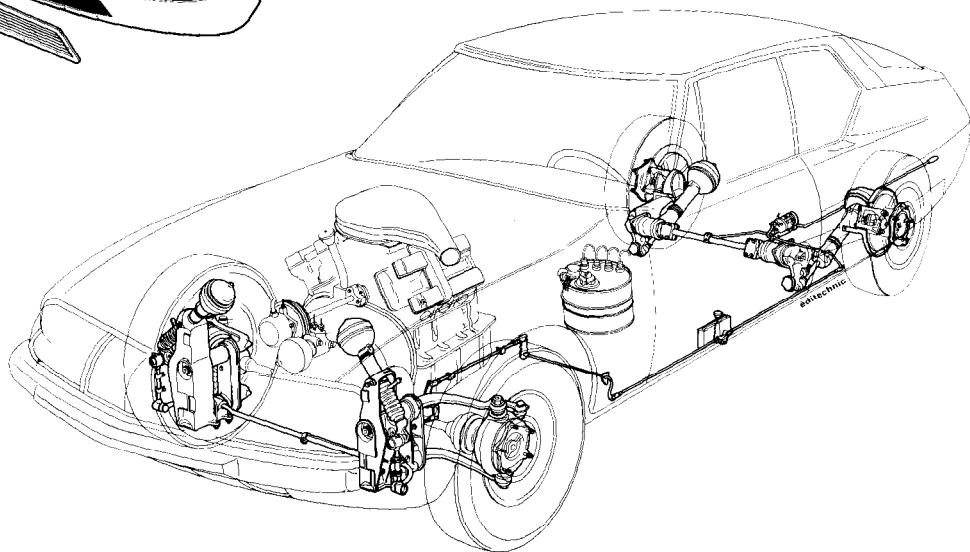
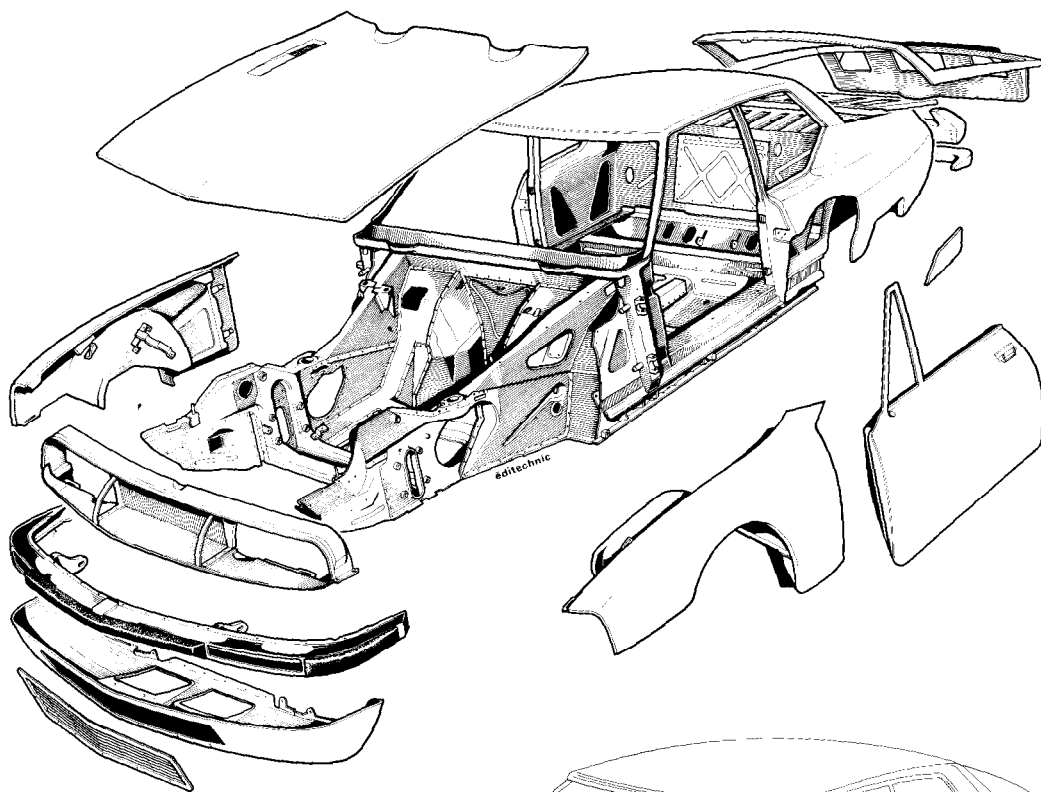
Official Citroën drawing of SM in 1970 emphasizes the car's considerable overall dimensions: slightly more than 16 ft long, and over 6 ft wide. Another notable point is the 200 mm (8 in) difference between front and rear track, showing the extent to which the SM's steering and handling was determined by its front-end geometry. Within the massive (by European standards) size of the car, the cabin space was much more restricted. In particular, the search for aerodynamic perfection led to limited headroom: the official 880 mm (34.6 in) shown in this drawing is far from generous



for emergency operation. At maximum speed, the seven-plunger pump was capable of delivering over 8 litres of fluid per minute at a pressure of nearly 2000 psi.

The suspension borrowed heavily from DS practice and differed in only one major respect. Citroën's strange curved front suspension arms, which in their geometry act as virtually equal-

FRANCO-ITALIAN TECHNIQUE



length wishbones, had trailing mountings in the SM, whereas in the DS they were mounted in leading fashion, attached to brackets on the main bulkhead. The DS arrangement certainly appears the lighter, avoiding the need to carry a substantial structure well forward to locate the suspension arms. On the other hand, rallying experience with the DS had shown that the suspension arms could be bent through having to absorb shocks in compression rather than tension, and in any case the engineering team favoured a remote suspension mounting to help isolate the passenger compartment from road noise. Refinement had assumed a new importance in view of the market at which the SM was aimed.

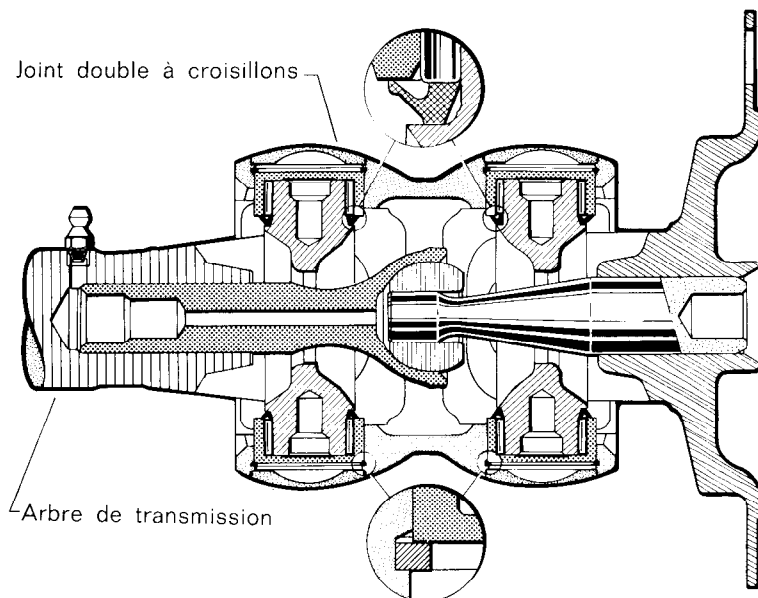
The rear suspension, as in the DS, used trailing arms attached to a cross-member beneath the back seat, leaving room for a very big (90 litres, 19.7 Imp. gallons) fuel tank under the boot floor. At front and rear, the plungers of the hydropneumatic spring-damper units were operated by bell-cranks to translate large suspension movements into small plunger movements. There was an anti-roll bar at either end of the car, though that at the front was so thin as to act as little more than the signalling link for the self-levelling and height-adjustable suspension. This left the front end of the car rather soft in roll, but extra roll stiffness would have increased the tendency to understeer and also have made the SM more ready to lift and spin the inside front wheel in hard cornering. The front suspension was, however, given a fairly strong anti-dive setting.

There has been some quibbling among technical commentators on Citroën's insistence on retaining a front suspension geometry which, with equal-length arms, causes the wheels to assume the same (often considerable) roll angles as the body. There is no doubt that better ultimate

Above opposite Most of the SM structure was welded into a single unit. The main exception, doors and rear hatch apart, was at the front where the wings and front panels as well as the bonnet were separately attached. The strength in this case came from the two forwards-extending longerons which carried the trailing-attached arms of the front suspension, cross-braced by the structure beneath the final drive and drive-shafts

Below opposite The SM suspension followed established DS principles for the most part, except that the front suspension arms had trailing rather than leading attachments in the hope (not entirely justified) of cutting down road noise. The arrangement also had the advantage of getting the front hydropneumatic units forward and clear of the wider engine

Citroën, long experienced in the construction of front-drive shafts and joints, refined the DS arrangement for the SM. As shown here in section, the 'modern' constant-velocity joint was eschewed for reasons of strength and longevity in favour of two back-to-back Hooke joints with the steering ball-joint sandwiched between them. The retaining arrangements for the needle rollers and their cups are particularly worthy of note



road-holding would be achieved by using unequal-length arms to keep the front wheels more nearly upright when cornering. Citroën's reasoning is that there is a vital difference between road-holding and handling. Improving the grip of the front wheels would not improve the overall balance of the car—an argument that applies with as much force to the CX as the SM, incidentally. The existing suspension arrangement means that all four wheels are equally constrained to lean with the car. The road-holding would certainly suffer were the tyres not able to cope with big camber changes, but to all intents and purposes the original Michelin X was developed for the Citroën DS, and its sophisticated successor the XWX is admirably suited to the SM.

That apart, there was little point in taking the trouble to provide true centre-point steering, with the turning axis of each front wheel passing

through the centre of the tyre contact patch as in the SM, only to compromise it by using suspension geometry that was subject to bump-steer, as unequal-length arms would have been. This argument was doubly important for the SM, where the bump-steer reactions would be fed back not to the steering wheel and the driver but to the power steering system. Since this was the only truly new system in the SM, the only unknown quantity where large-scale service was concerned, it was felt advisable to spare it as many shocks as possible.

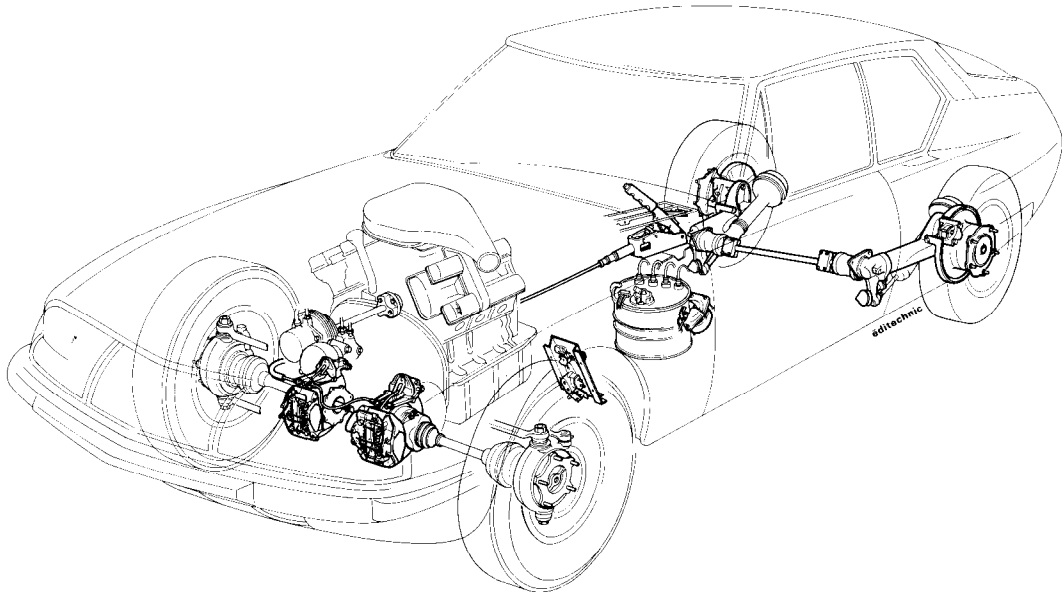
The SM was the proving ground for the VariPower steering, which is not power assisted in the manner of most 'power steering' systems in modern cars, but a true servo mechanism in which the driver's wheel movements merely signal what ought to be done (a manual link remains for the sake of safety, but is normally redundant). Such a fully powered system gives the designer plenty of scope if he cares to take advantage of it, but suffers from one major drawback. In its simple form it is devoid of feel, leaving the driver with no direct impression of the direction in which the front wheels are pointing.

With VariPower, Citroën tried to turn necessity into a virtue. It would have been possible to provide a simple artificial-feel arrangement consisting of springs, but the chosen solution was far more subtle, if also rather more complicated. With the aid of a cam-and-follower arrangement, and a hydraulic governor mounted on the nose of the gearbox, they produced a system in which the steering effort can be regulated according to circumstance. The governor takes line pressure from the ubiquitous hydraulic system and regulates it according to the speed of the car. The higher the speed, the greater the pressure applied to the cam follower, and the harder it becomes to

depress it. The actual shape of the cam means that the effort increases towards full lock, and the combined result is that considerable effort is needed to turn the steering wheel fast and far at high speed. Citroën gave some insight into the kind of performance for which they were catering by setting the maximum feel-pressure cut-off point at 200 km/h (124 mph).

The feel-pressure does not fall to zero when the car is at a standstill with the engine running, but is reduced to a level which makes parking simple. One interesting aspect unique to the SM, and the CX which followed it, is that the pressure of the follower on the cam is always trying to force it back to the centre position, so the steering has 'dead-beat' self-centring. Even when the car is at a standstill, the wheel will still wind itself back to the straight-ahead position when released. More reassuring perhaps is the fact that because the system completely isolates the steering wheel from front-wheel reactions, a front tyre blow-out has no effect on the steering. This, coupled with the self-compensating action of the suspension, makes the SM particularly safe. The only drawback is that it is possible to drive for some distance before realizing that a tyre is flat—and the suspension does *not* protect a tyre from run-flat damage!

For the sporting driver, the appeal of the SM steering was not the effort which had gone into designing the self-regulating feel system; it was the fact that advantage had been taken of the full-power facility, plus the safety of the speed-related feel, to give the SM just two turns of the steering wheel from lock to lock. Such 'quick' steering promised much for anyone with the finesse to put it to good use. Opinions regarding it inevitably differed, as we shall see, but on the whole it was accepted as a good thing and no change was made



throughout the SM's life. For the CX, however, the gearing was relaxed to a more conservative two and a half turns of the wheel between locks.

The brakes followed later DS practice, taking pressure from the hydraulic system and metering it through a valve system sensitive to foot pressure rather than movement. Because the original DS 'button' had proved too sensitive for some people to master, the control had been modified to a rubber mushroom shape with enough squidge to convince the unbelieving that something was indeed happening. At the business end, the brakes consisted of big discs all round—10 in. outboard at the back and 11.8 in. inboard at the front. The front discs were not ventilated, one of the few things to identify the SM as a 1968 and not a 1978 design.

Inboard front discs had been a feature of the DS, and were adopted to save unsprung weight and to

Like the DS, the SM employed a full-pressure servo braking system, with big discs front and rear. The front discs, mounted inboard, were especially complex since in long-established Citroën tradition, their calipers had to incorporate the auxiliary handbrake pads also. Great care was taken in the design of the system to avoid premature rear-wheel locking

ease the task of achieving the centre-point steering already discussed. At the same time, inboard brakes have acknowledged disadvantages in that the drive shafts have to withstand high torque loadings and that access is difficult. The front caliper assemblies of the SM are indeed a daunting sight, not least because as with all Citroëns (discounting the later breed of small Peugeot-allied ones) the handbrake acts on the front wheels rather than the rear. This normally gives a much higher standard of emergency performance, but in the SM the parking brake pads were very small and the car failed to win much praise in this department. Tests usually reported a failure to hold on a 1-in-3 gradient.

Aside from the usual trickeries of the powered Citroën suspension, brakes and steering, the SM boasted an extremely advanced lighting system using six Cibie halogen units. The system was self-levelling—what Citroën do in 1970 the rest of Europe gets round to legislating for in 1980—and the inner units swivelled with the steering to give a better look round each dark corner. This was yet another idea which had first seen use in the DS.

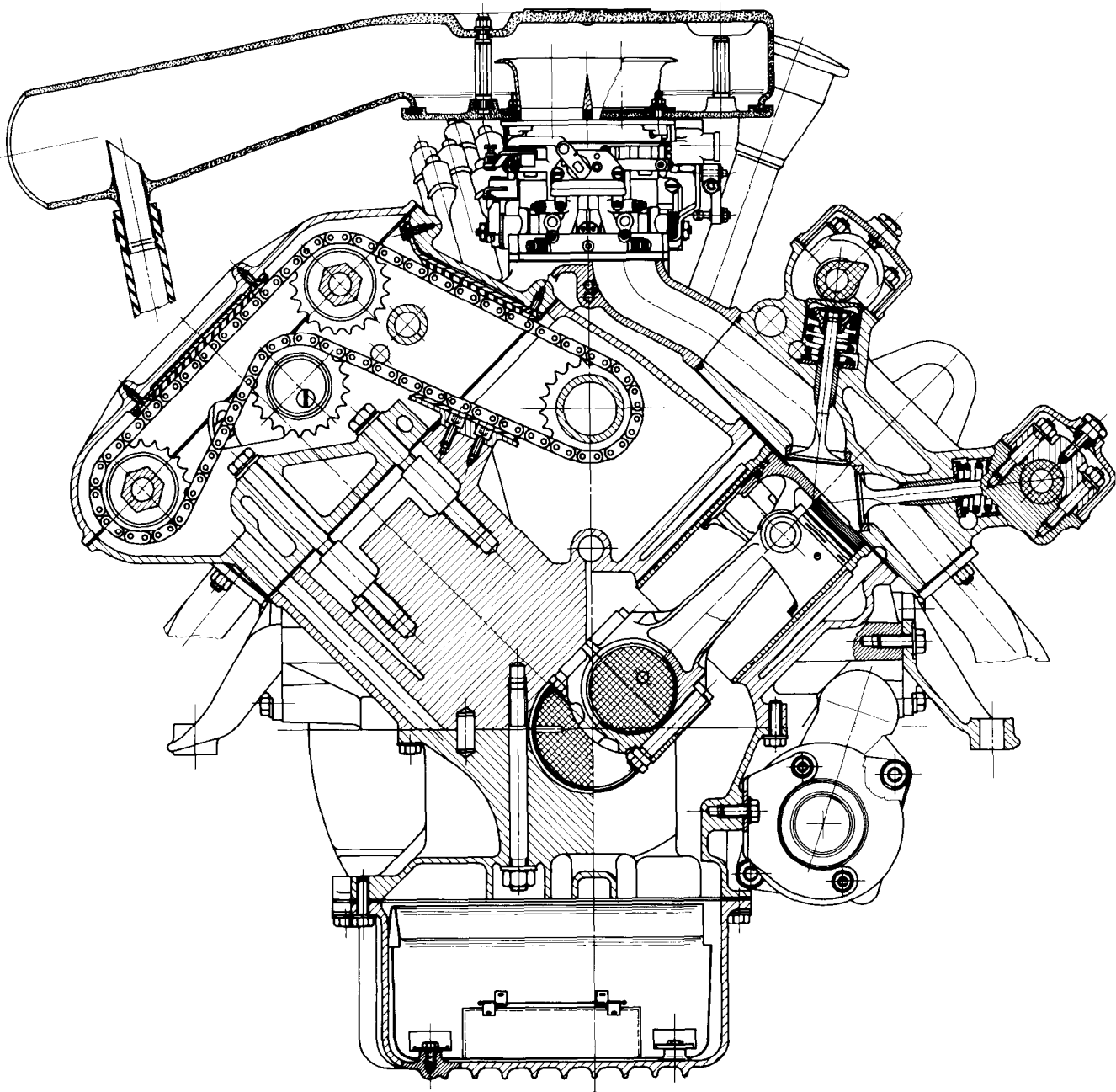
If the styling, the structure and the systems were all-Citroën, the engine not unnaturally had the immediate stamp of Italian *brio*. There was no hiding the fact that it was slightly rough compared with the V8 from which it had been derived; there is an inherent secondary imbalance in a V6 engine with a 90-degree angle between its banks, the ideal angle being 60 degrees (or of course 120 or 180 degrees). Such an imbalance holds no terrors for modern designers with the engine-mounting techniques now at their disposal—the 90-degree V6 remains a jewel compared with the in-line three- and five-cylinder layouts which are now so calmly accepted and the SM engine found a later imitator in the 'Douvrin'



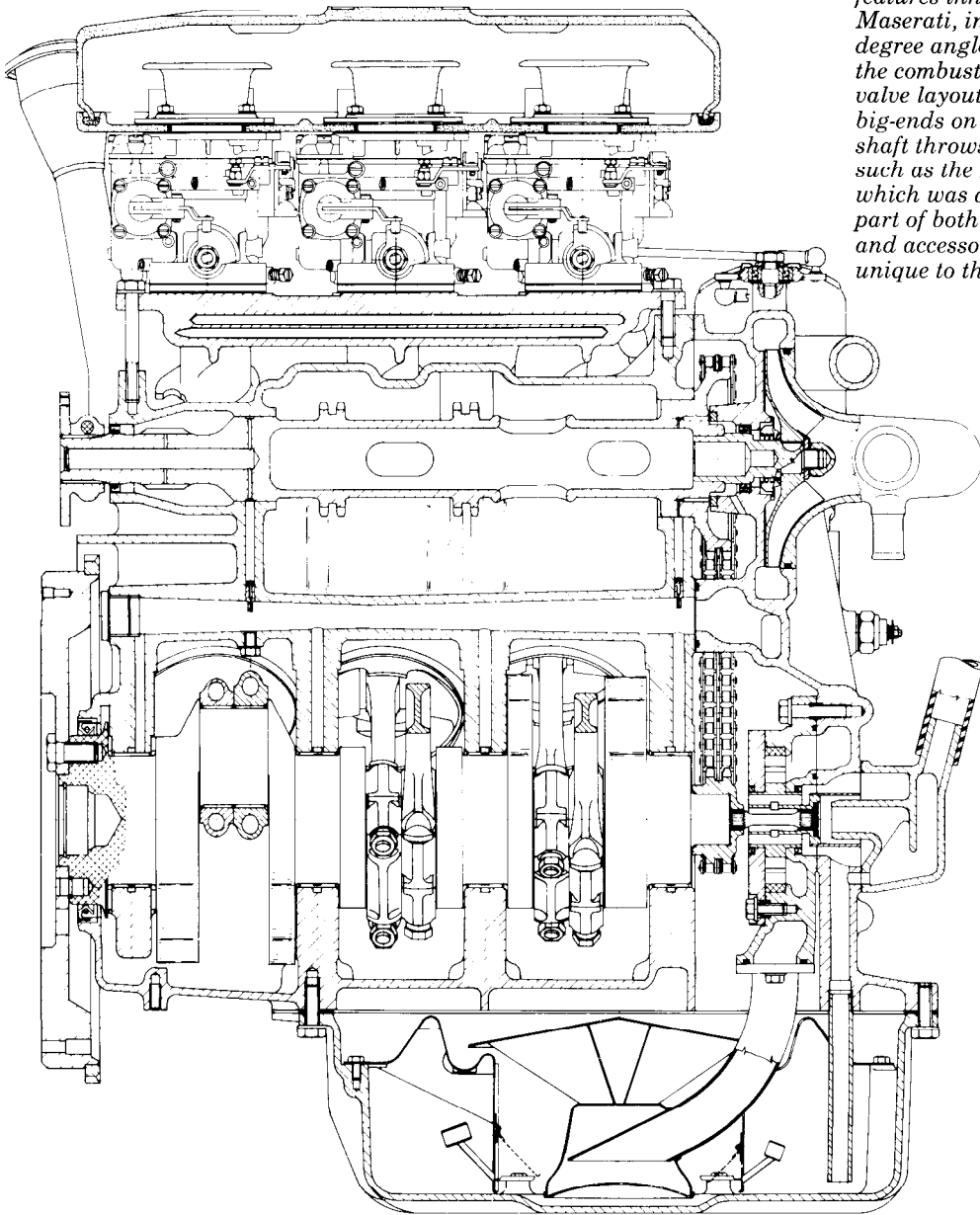
Peugeot-Renault-Volvo V6 of remarkably similar capacity (but notably less output). This engine is said likewise to have started life as a V8.

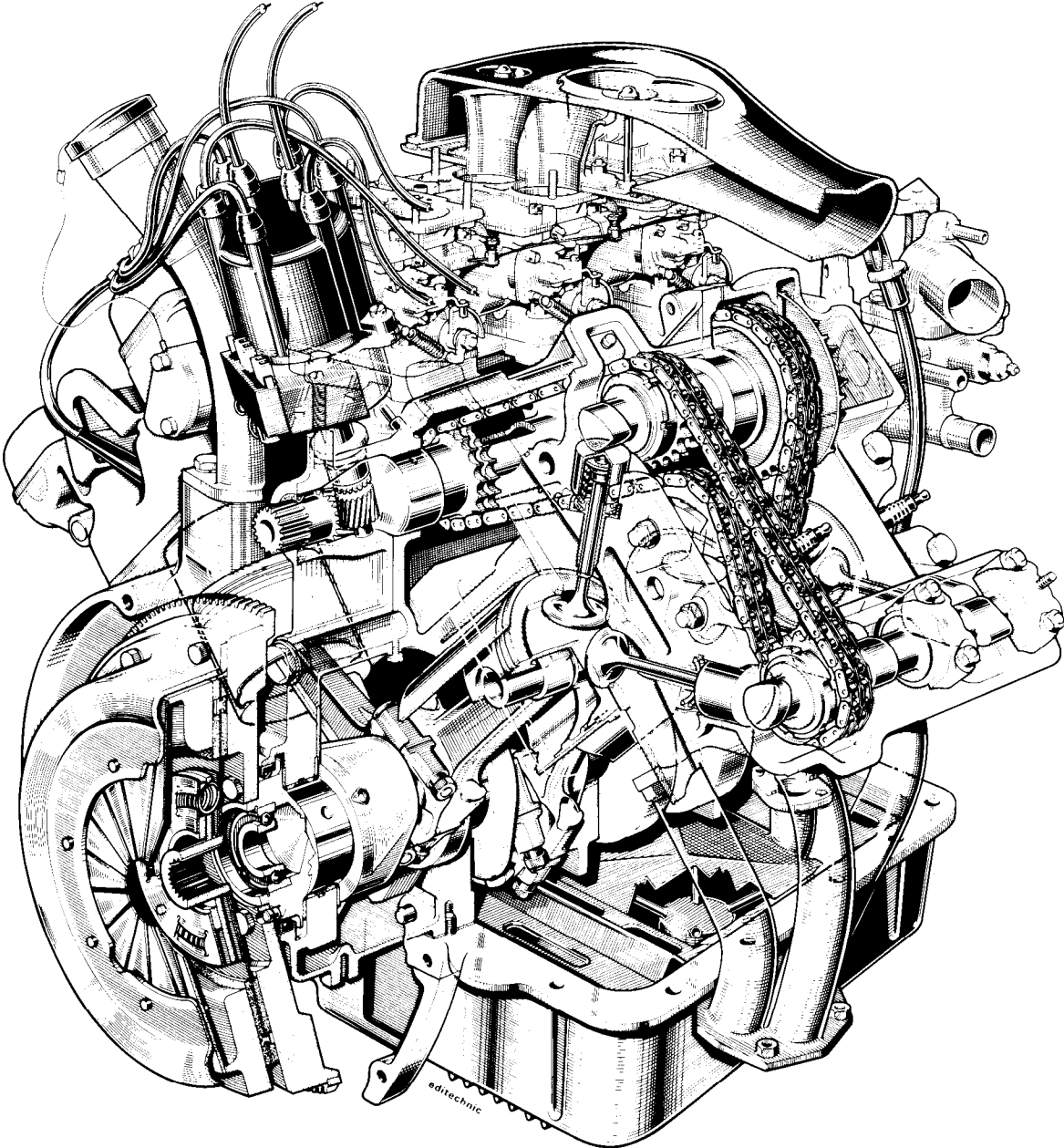
Whatever the SM unit had lost in smoothness compared with the Indy V8, it gave excellent performance. The smaller number of cylinders probably meant fewer internal losses, while its

Take it from the front . . . one of the dominating external features of the SM was its Cibie lighting system using no fewer than six separate units, of which the innermost pair swivelled in sympathy with the steering



Sectioned drawings of the SM engine show some of the features inherited from Maserati, including the 90 degree angle between banks, the combustion chamber and valve layout, and the paired big-ends on the three crankshaft throws. Other features such as the massive jackshaft which was an essential part of both the camshaft and accessory drives, were unique to the SM

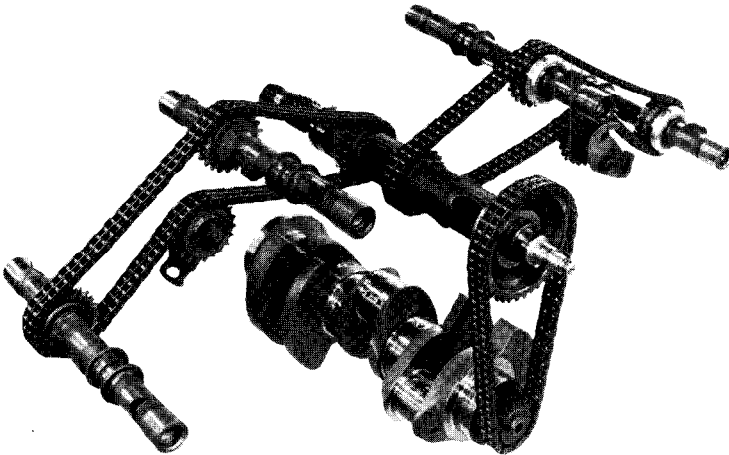




shorter stroke and the rigidity of its four-bearing crankshaft made it extremely willing to rev. Like all the Maserati engines, it was made principally of aluminium alloy, beautifully die-cast. This was important to Citroën, faced as they were with a heavy chassis and the need to keep the weight on the front wheels to a minimum. The rest of the car may be hefty, but the engine is not. It turns the scales at 309 lb (140 kg), or less than 2 lb/bhp.

The cast-iron cylinder liners were pressed in 'dry', contrary to established Peugeot-Renault practice as seen in all three Douvrin engines. There were four main castings: the two cylinder heads, the main block and the lower block. The two block castings split along the centre line of the crankshaft, so that the shaft itself ran as it were in two sets of half-bearings, sandwiched between the two bolted-up castings. It made for great rigidity, but was certainly not calculated to make major engine overhauls any cheaper. There were two direct-acting camshafts per cylinder bank, operating the valves by means of inverted bucket tappets with shim adjustment. The valves sat opposite one another in classic hemispherical

Above opposite Some details of the SM engine are more clearly seen in this cutaway. The short stroke of the unit helped to make it compact, partly overcoming the problem of space taken up by the four overhead camshafts. The jackshaft between the cylinder banks was driven by duplex chain from the rear of the crankshaft, which carried the diaphragm-spring clutch at its forward end. The skew-driven distributor is worthy of note, its two inner leads showing that it is in effect two three-cylinder distributors in a single casing

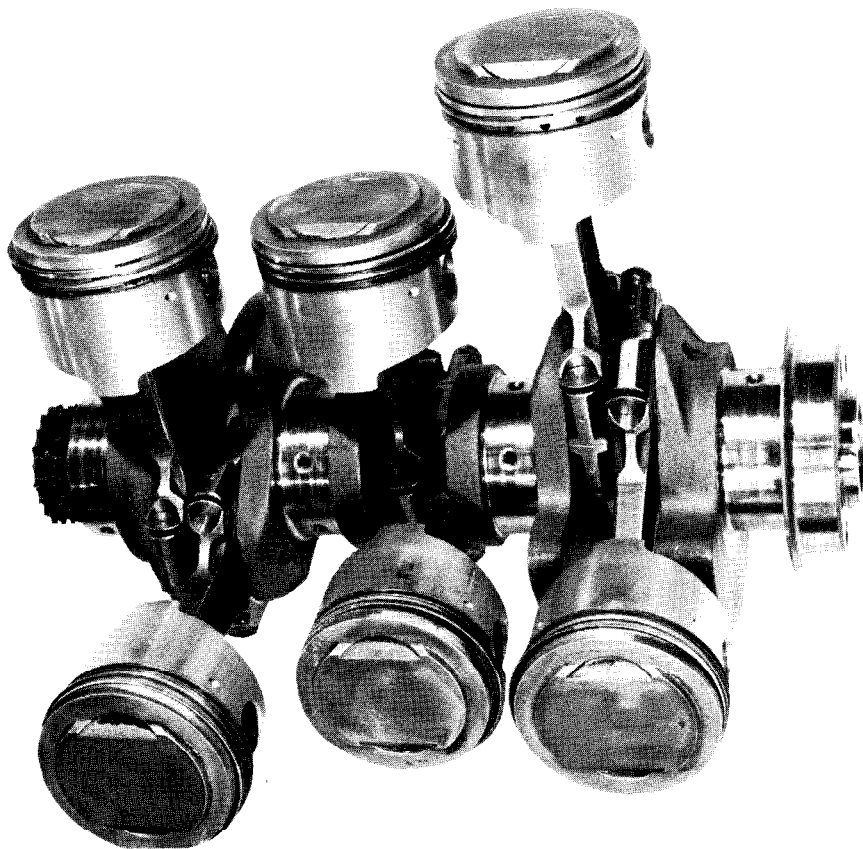


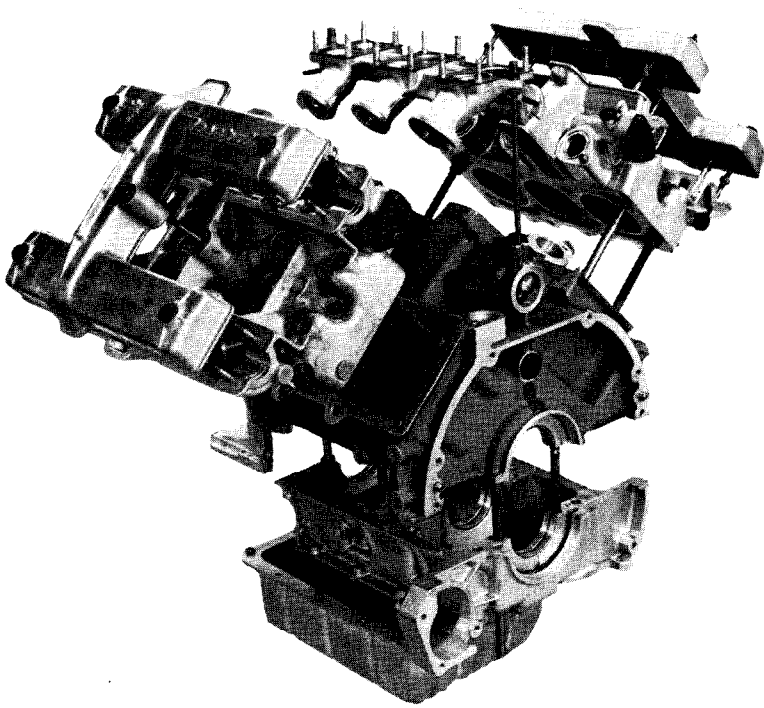
Left Only in such a detail shot can the complexity of the camshaft drive in the SM be altogether appreciated. One major design error was to try to get away without fitting a tensioner on the primary drive chain. The secondary chains, which ran between opposing pairs of cylinders, were provided with tensioners, albeit manually adjusted. The massiveness of the carefully balanced crankshaft can also be seen

The complete rotating assembly of the SM engine made a fine sight when fully built-up. The shortness not only of the stroke, but also of the connecting rods, is evident in this factory shot. The pistons with their raised centre lands and cut-away sections for valve clearance ran in dry cast-iron liners in the alloy blocks

combustion chambers, their included angle being 76 degrees. As the engine drawings show, the inlet and exhaust tracts were straight and generous, and the engine's breathing was in the main only restricted by camshaft overlap and valve spring design. Single springs were used with a bounce point (as the road testers soon discovered) of just under 7000 rpm.

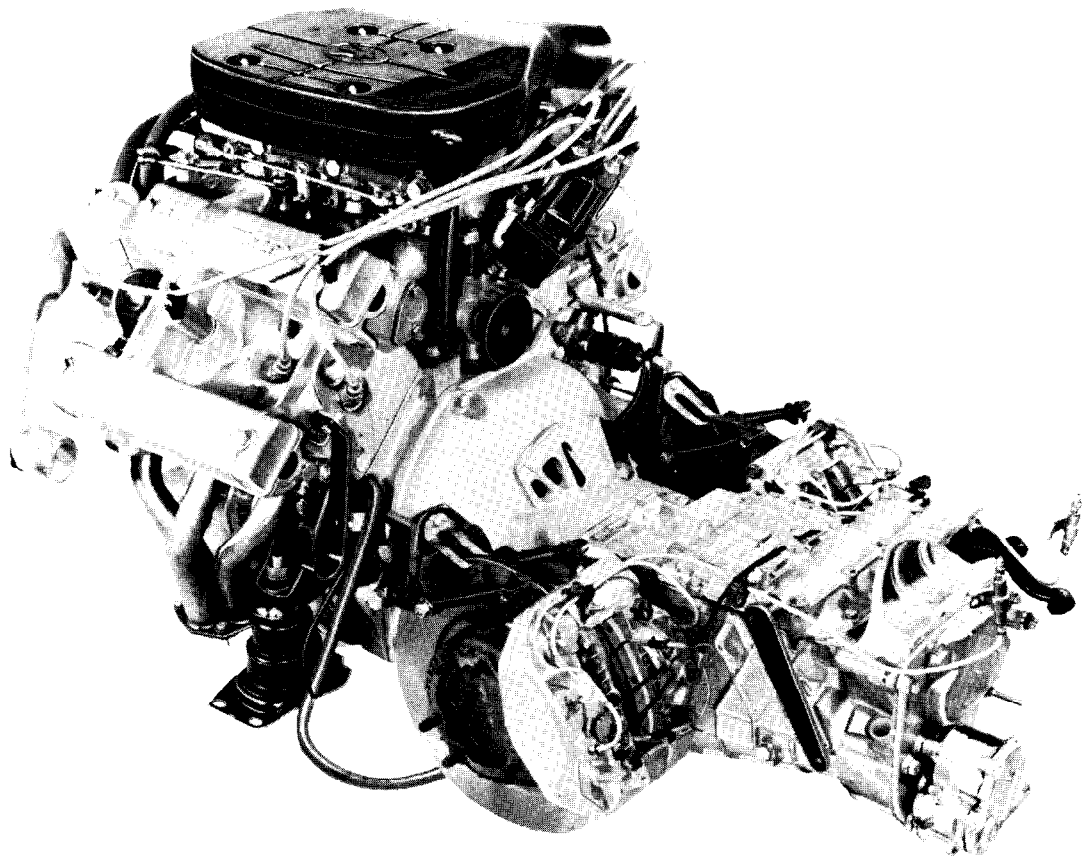
In transverse section, the SM engine might almost be that of the Maserati Indy. Other views tell a different story, and not just because of the six cylinders. A remarkable camshaft drive system was evolved in a determined effort to keep the length of the engine to a minimum. It used duplex chains, with the primary drive (at the aft of the





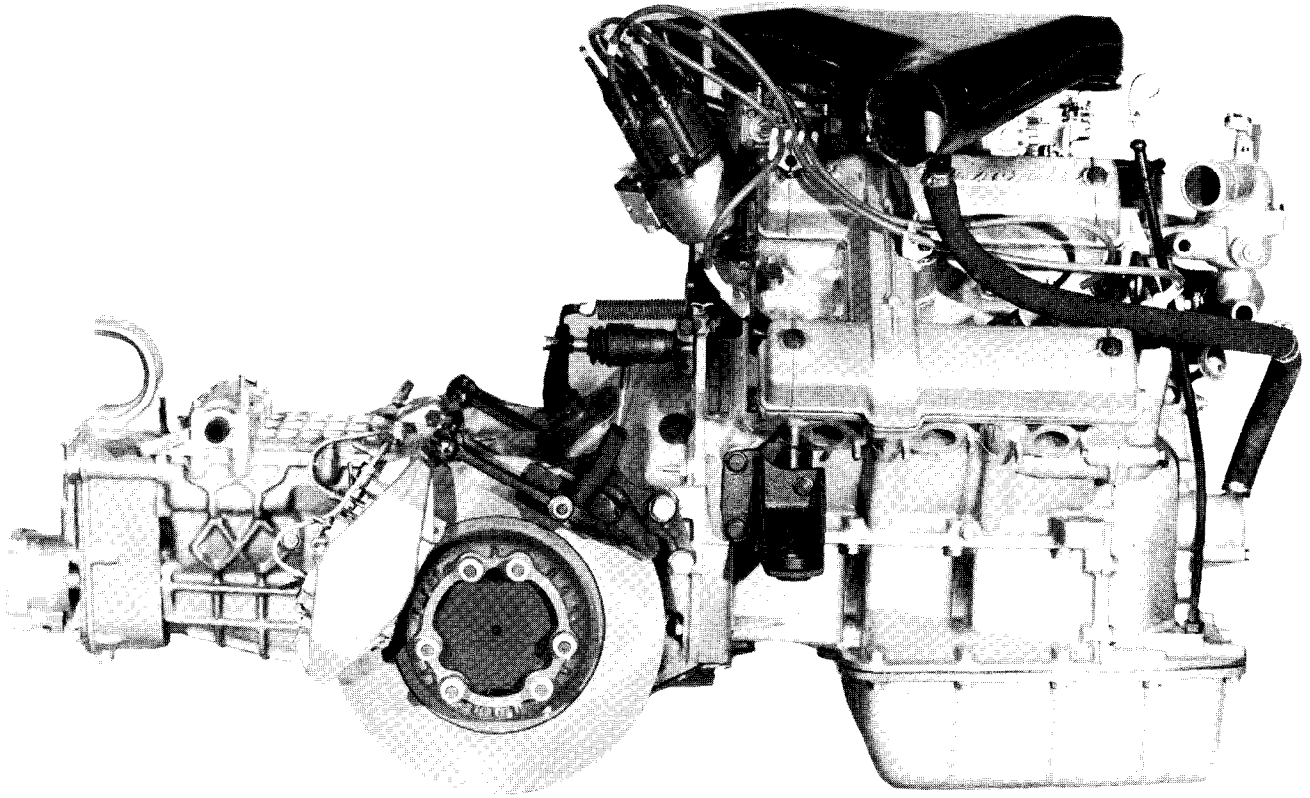
The all-alloy V6 engine consisted of five main castings of which the biggest was the upper crankcase (which also housed the jackshaft). The lower crankcase bolted up to sandwich the crankshaft, and the cylinder heads and sump completed the assembly. Note the transverse sections joining the camshaft covers, showing where the cam drive chains ran. This view is from the clutch (forward) as installed) end of the engine

engine as it sits in the car, naturally, because the transmission is at the front) taken to a very large jackshaft running in plain bearings formed in the 'vee' of the engine. This shaft is a considerable component in its own right, a hollow casting of large diameter, with the aim of preventing any movement under torsion which might upset the valve timing. Two sprockets on this shaft each drive a secondary chain to turn the camshafts, running between cylinder centres. Thus the drive to the left-hand pair of camshafts (looking from the driver's seat) runs between the forward and centre cylinders, while the right-hand pair are driven between the centre and aft cylinders. It looks and is a complicated arrangement, but apart from saving length it has the advantage of splitting the drive so that the risk of torsional



As seen here, the SM engine in built-up form looks almost simple, or at least understandable. Even here, much of the bulk is added by the inboard disc brake units—but on the other hand, the massive accessory drive assembly which sat above the gearbox, with all its associated piping, is conveniently absent

vibration—a pretty remote risk anyway—is kept to a minimum. Nor is adjusting the tension of the secondary chains as difficult as it might seem. There is no adjustment on the primary chain, a calculated design risk in view of the fact that it runs between two sprockets with a virtually 180 degree wrap round them both, with little apparent chance of jumping a tooth. Alas, it was a bad decision, and trouble was experienced particularly in engines that were revved to the limit, with expensive valve damage as the usual result.



A manual tension adjustment was out of the question anyway because it would have been virtually inaccessible. With the benefit of hindsight, it is clear that the alternative of an automatic tensioner was too readily rejected.

The big jackshaft serves not only as an intermediary in the camshaft drive but also drives the water pump, at the aft end of the engine, and the distributor, via a skew gear at its forward end. The oil pump, a crescent-type unit, is driven by quill shaft from the aft end of the crankshaft. A

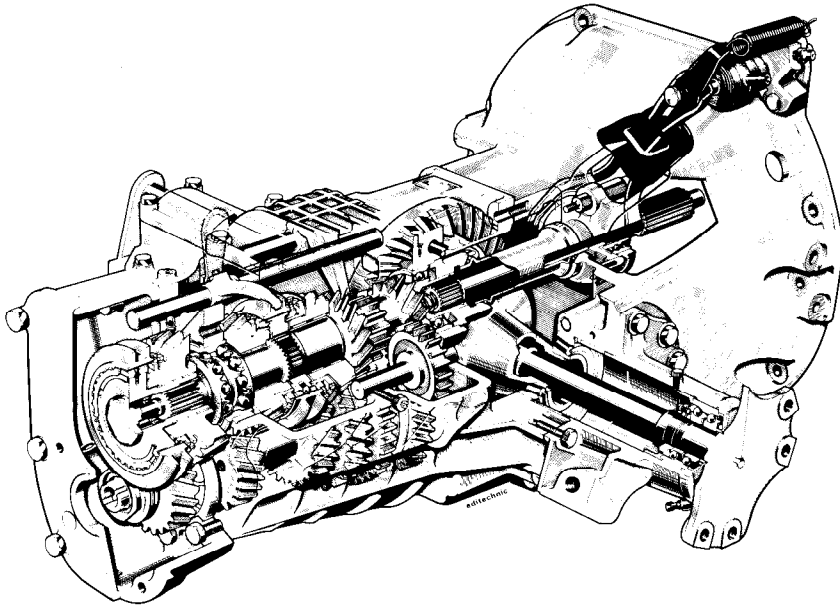
A side view of the same engine shows among other things the water pump housing (driven from the aft end of the jackshaft) and some gearbox details including the VariPower steering effort governor on the gearbox nose, and the cross-shaft for the gear-change mechanism. The three power unit mountings are also evident

flexible shaft running forward from the nose of the jackshaft turns a pulley assembly serving the high-pressure hydraulic pump (effectively direct-driven in view of its importance, and not dependent on a belt), the alternator and the air-conditioning compressor when fitted.

In its first form, the engine was fed by three twin-choke Weber 42 DCNF2 carburettors, giving one large choke per cylinder. The considerable majority of cars were built in this form, the engine carrying the Citroën designation C114-1. The compression ratio was 9:1, and peak power was 170 bhp (DIN) at a relatively modest 5500 rpm. Peak torque, by odd coincidence, was 170 lb ft at 4000 rpm. The specific output of 64 bhp (DIN) per litre was high, but not alarmingly so; an interesting comparison is the contemporary Alfa Romeo 1750, which gave 68 bhp per litre. In practice, the engine held its tune well unless it was consistently run to over 6000 rpm. Resetting the carburettors was a major task, but the distributor was at least accessible; it was an odd unit, effectively two distributors in a single casing, with feeds from two coils, and two contact breakers.

Engine cooling depended on a large radiator served by two electric fans, thermostatically controlled. The ducting to this radiator was as carefully studied by the Citroën aerodynamicists as was the car's exterior. An oil cooler was standard.

The two-shaft, five-speed, all-indirect gearbox sat forward not only of the engine but also of the differential, as in the DS. The drive was carried to the input shaft above the differential cage, and the output shaft had a spiral-bevel (not hypoid) drive to the crown wheel. The arrangement virtually forced a numerically high final-drive ratio, and the SM had 35 teeth on the crown wheel



and eight on the pinion, for a ratio of 4.375:1. To counteract this the gearbox internal ratios were high, with fourth as well as fifth being 'overdrive' ratios greater than unity. Fifth gear, with the initially standard 195/70-15 in. Michelins, gave 22.6 mph per 1000 rpm, or 124 mph at peak power. The official red line was set at 6000 rpm, although the engine was safe beyond this; in fact Citroën's claimed maximum speed was equivalent to 6050 rpm. Given the isolation of the gearbox from the driver, the gearchange mechanism could not help but follow a tortuous route between the two, and the worst might have been expected. Mercifully, Citroën and Maserati were well aware that a poor gearchange would blight a car intended as a true GT for keen drivers, and great care was taken in the design, which would repay close study by the makers of some other remote linkages. The secret is simple. All the links in the

Citroën developed their own five-speed gearbox, an all-indirect unit in which the two top ratios were 'overdrives'—an arrangement made necessary because the final drive had to be numerically large. Drive was taken via the quill shaft above the differential cage, and the final drive itself was spiral bevel rather than hypoid

SM system are sturdy, the joints are properly engineered and the intermediate mountings properly stiffened against unwanted movement. As a result, though the SM change may at times have been mildly criticized for its high inertia—feather-light it was not—its precision was always exemplary. The clutch was a straightforward 9 in. diameter dry-plate unit with hydraulic operation. Servo operation, using a bleed from the power hydraulic system, would have been possible, but this was judged likely to find little favour with drivers who relished a five-speed manual gearbox.

The drive to the front wheels employed shafts with inboard pot joints capable of accommodating small amounts of plunge, while the Citroën-designed outer joints (as illustrated) consisted of a back-to-back pair of Hooke joints with an intermediate ball-and-socket on the steering axis. The final drive was not limited-slip, although such units were employed on some of the works rally cars. For normal use, it was felt that the risk of excessive understeer in some situations was not worth it, quite apart from the cost and the possible difficulties with lubrication.

This, then, was the form in which the SM was first presented to the motoring press at Geneva early in 1970. The response, as far as Citroën were concerned, must have been gratifying, even though production and proper road-test cars were still months away. Why, then, the hurry to present the SM? Partly because Geneva is a natural showcase for the exotic, and partly because the Citroën press office knew what the journalists didn't: that the latter part of the year was allotted to the launch of the GS. And in the end, quite rightly in the general context, it was the GS that took the Car of the Year award. The SM was going to have to exist in a more rarefied atmosphere.

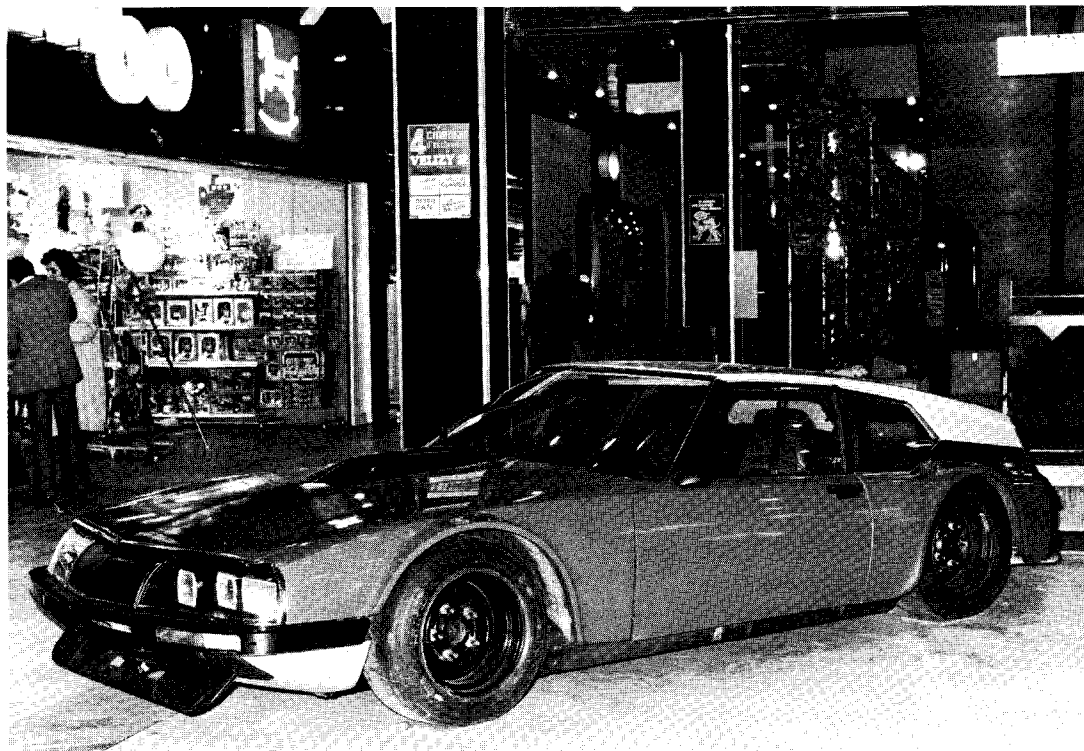
Chapter 3

A case of limited development

One of the apparent disappointments of the SM programme is that so little was done to exploit the car as a basis for other models. It is true that the 12,920th SM to emerge looked very like the first and that, outside the engine compartment, very little had been done to the design in the meantime. Yet the inevitable enthusiast's question merely begs one in return: How do you 'develop' a car like the SM?

There are, it is true, a couple of obvious trains of thought. One is to stiffen the car and give it even more power, to make it a GT with genuine sporting overtones. The other is to take off the roof. Both were tried, though Citroën themselves never ran a convertible. Any thought of building alternative versions in series was discouraged by the SM's failure, through no fault of its own, ever to establish a worthwhile sales rate—as we shall see.

One extremely ugly 'breadvan' GT was built, to fulfil the triple function of development car, demonstrator and toe-in-the-water if it was ever decided (which it wasn't) to go racing. This car, shown here, had a 3-litre version of the V6 engine from which Alfieri had extracted 340 bhp. It ran on wide racing tyres, of course, and the changes to the bodywork included not only the built-up back end, which presumably sought to reduce the drag



Citroën made public this 340 bhp 'breadvan' prototype at (of all places) an exhibition in the shopping centre of the Velizy II new town on the outskirts of Paris. The car approached 180 mph on test and lapped the Michelin test track at Clermont-Ferrand—which, although fast, is not banked—at over 140 mph. To ensure stability at such speeds, a front spoiler was found necessary

coefficient still further, but also a very large beard-type front spoiler immediately aft of the engine-cooling air intake. All development driving was carried out on the Michelin test track at Clermont-Ferrand (not the racing circuit); this generous high-speed track was eventually lapped at 149.7 mph (240.8 km/h), and the maximum speed attained by the car was 177 mph (285 km/h).

Although the GT never saw production, it did serve a useful purpose in proving the 3-litre engine, which at the end of the day was installed in much milder form in the SM, apart from being used in the Ligier JS2 at a time when Guy Ligier's ties with Citroën were close. One suspects it may also have proved more than interesting to Mich-



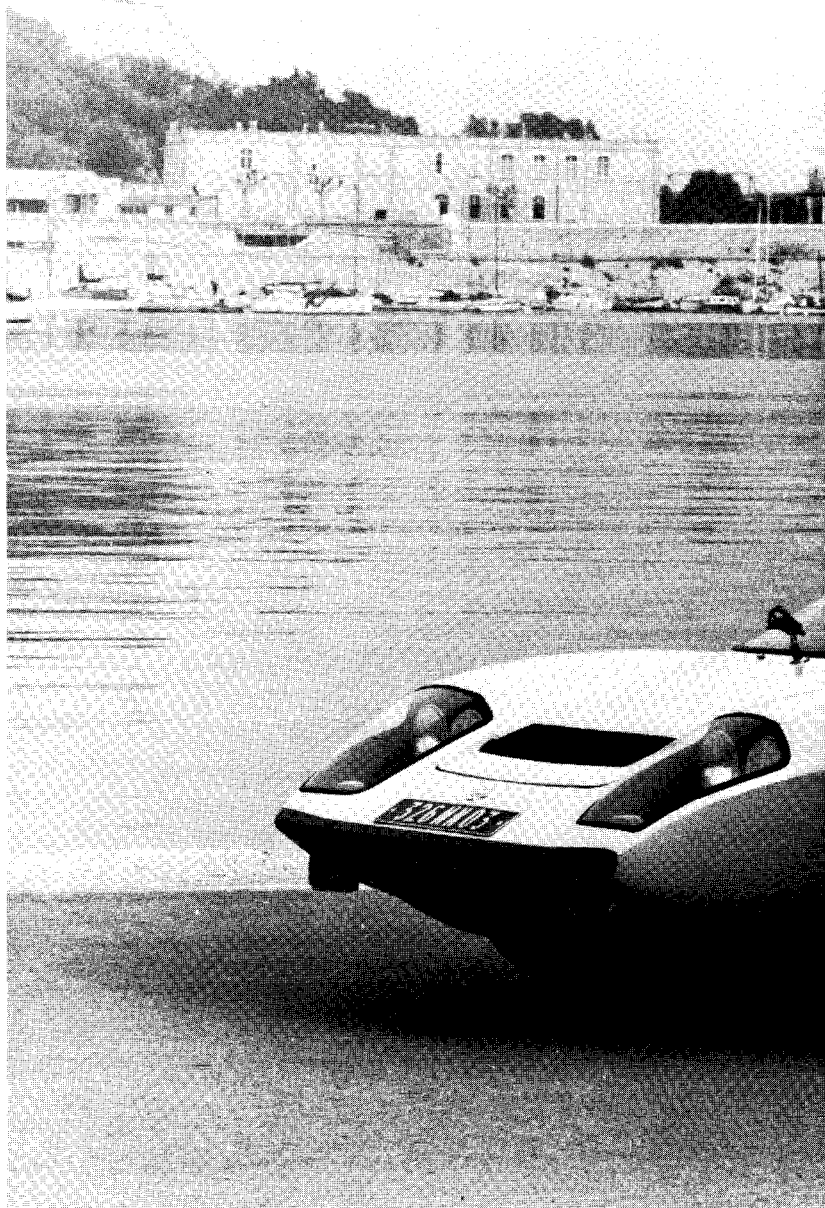
elin, whose sights were already set on the racing programme that came to fruition with Renault and Ferrari.

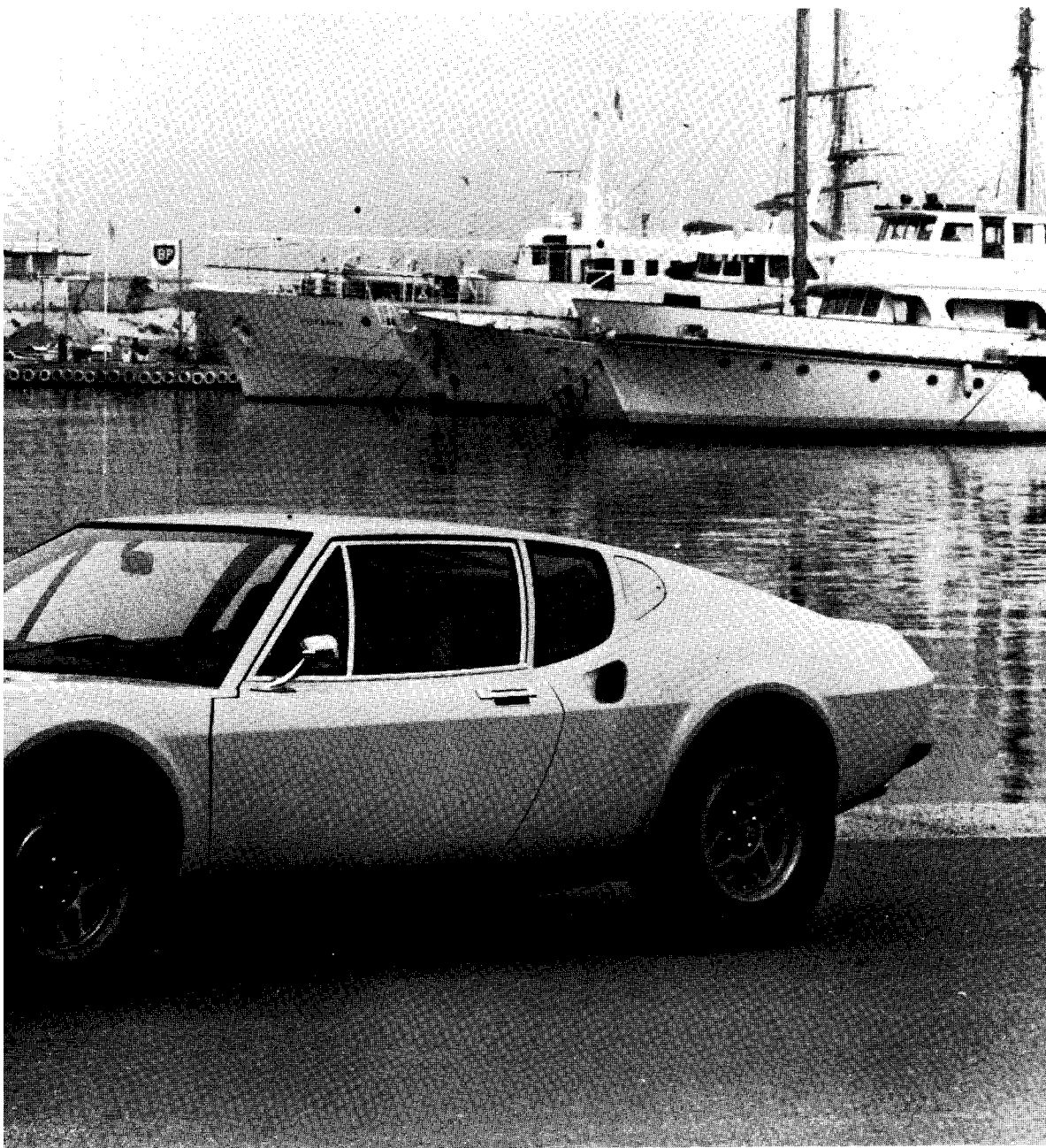
A convertible SM was an attractive proposition, sufficiently so for the French body-builders to have several tries at it. Chapron, whose association with Citroën goes back a long way, showed a simple decapitation job at the 1972 Paris Salon, but Citroën's own engineers were wary. As was pointed out in the last chapter, the SM structure includes the roof as a welded-in and essential part, and to cut it out leaves a weaker structure unless some underpinning is added to the floorpan. This is the inevitable problem for all converters of unitary bodies, and it has prompted

A view of another competition prototype shows that to a remarkable extent, it remained fully equipped, while the half-transparent rear panel, with inset chevron, suggests that design thought had been given to series production of a road-going version

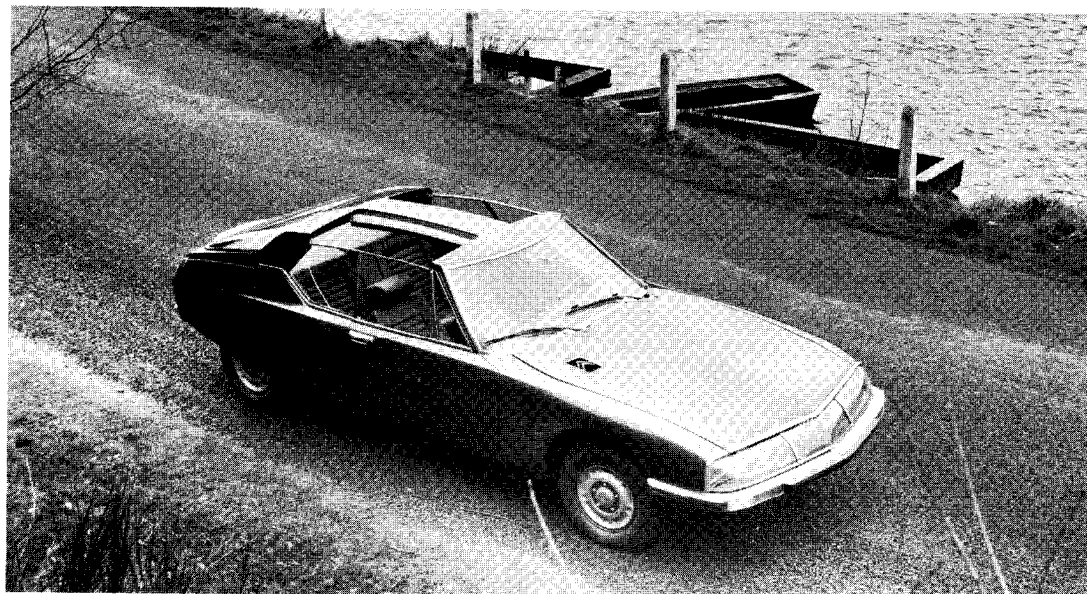
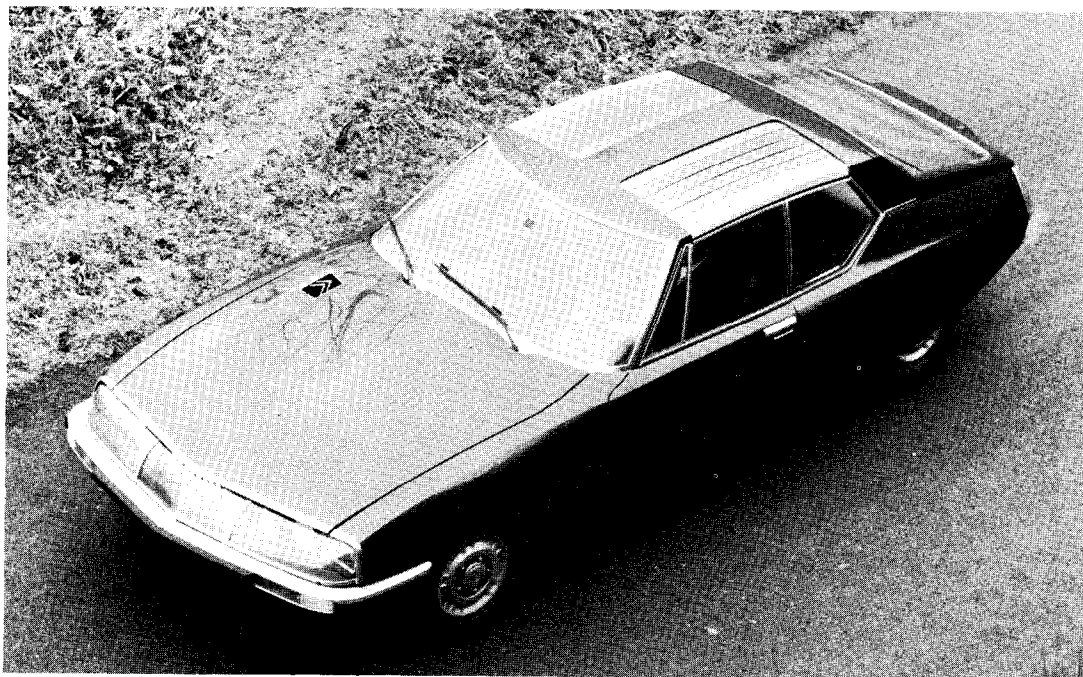
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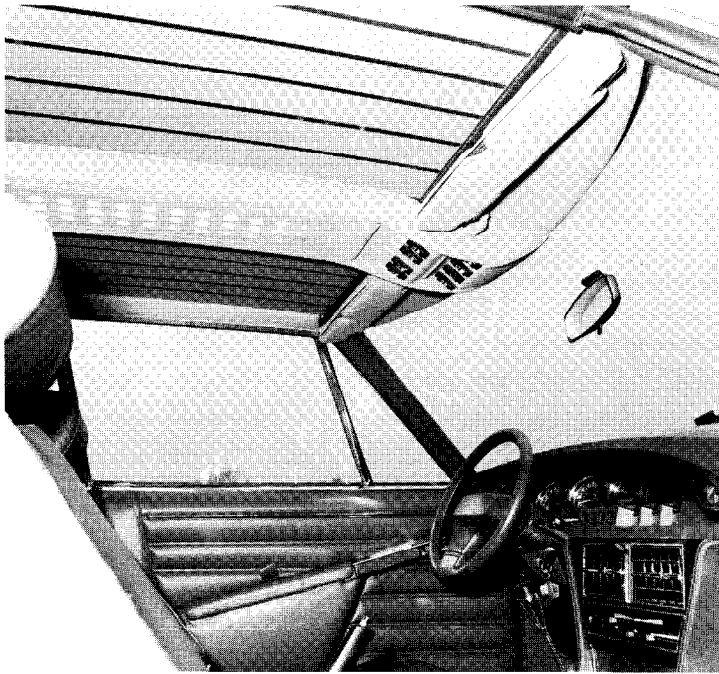
One of the SM-powered breed: Ligier's JS2 performed well with the V6 engine although originally the chassis had been designed around the Cosworth FVA. Over 100 such cars were built to complement Ligier's eventual contribution to the production story of the SM itself. Ligier however was canny enough to stick to SM power without embracing the other complications of its chassis





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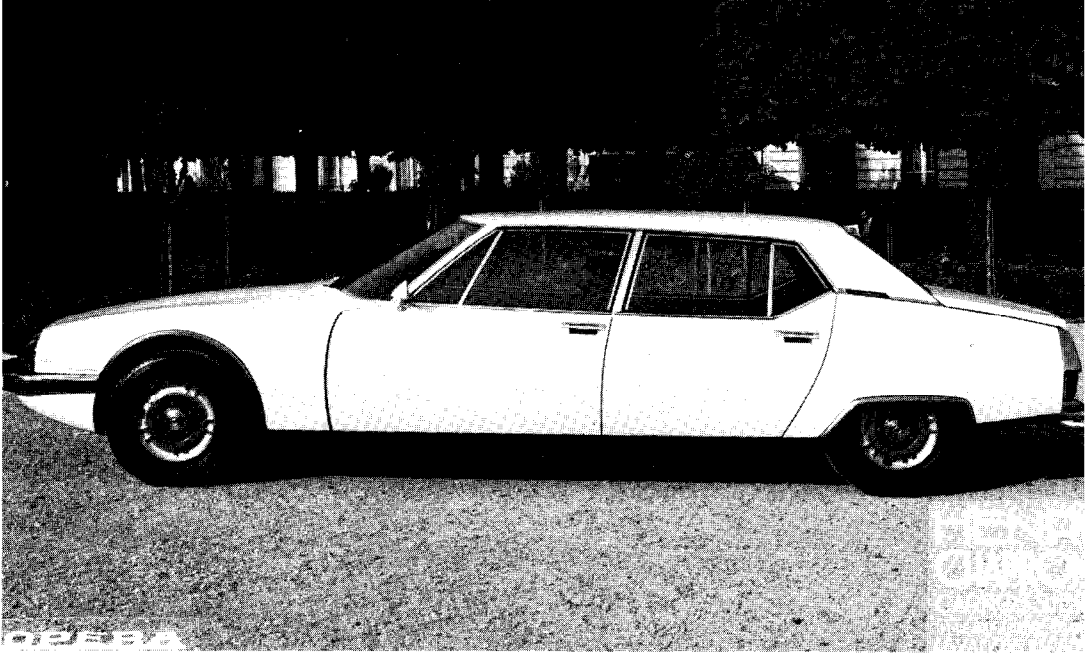


The appeal of an SM convertible was obvious but the execution of the idea was difficult. Perhaps the most practical solution came from Heuliez who adopted this Targa/T-bar approach reminiscent of the near-contemporary Triumph Stag. The front end of the T-bar housed two banks of extra switches in this demonstration car, showing that in theory at least it was possible to operate the two halves of the telescopic roof independently

many designers to consider instead the idea of a T-roof, leaving a strong central spine with detachable panels on either side. Citroën's official thinking was along these lines, and Heuliez built a prototype installation for them, as shown, which left the rest of the car very much as it was. The idea worked well and this was the nearest any modified SM body came to production, but the potential market simply was not large enough to justify it.

Chapron, not content with trying a proper soft-top SM, also stretched the car into four-door form. His first attempt, the Opera, was shown alongside the *decapotable* at the Paris Salon. The SM actually looked very good whenever it was lengthened and given four doors, for the extra

Opposite When open, and especially with the windows down, the Heuliez car provided a taste of genuine open-air SM motoring. The concertina-folding of the two roof panels into the central spine looks complicated, but apparently worked well



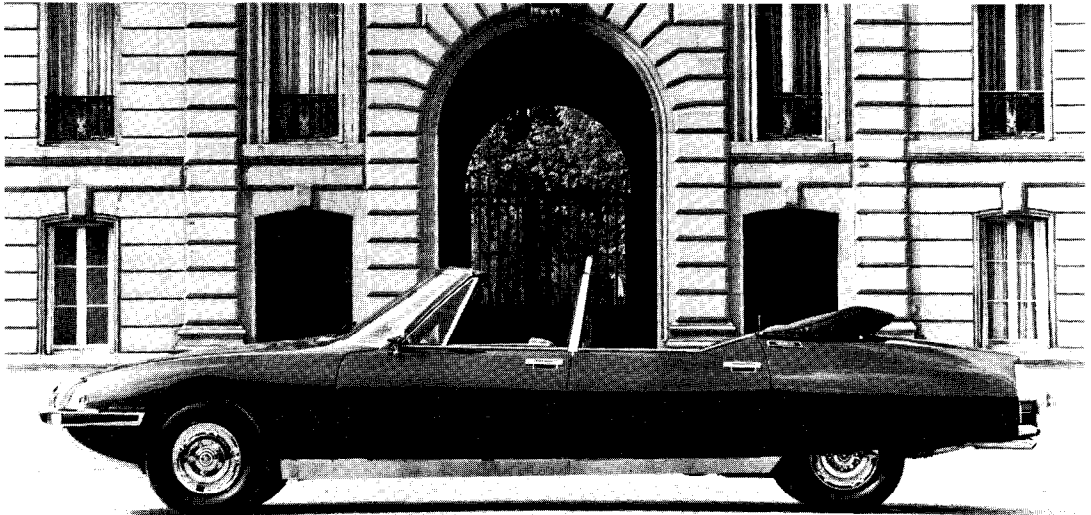
Above Chapron's long-wheelbase, four-door Opera version of the SM, seen only in prototype form showed how very large the car had to become if it was to offer an interior of limousine proportions. Even so, the Opera formed a useful basis of experience for . . .

. . . Opposite the four-door SM convertibles delivered in 1972 for French Presidential use, and still in service at the time of writing. The ultra-long hood is hydraulically operated. A manual gearbox is retained, with lower overall gearing

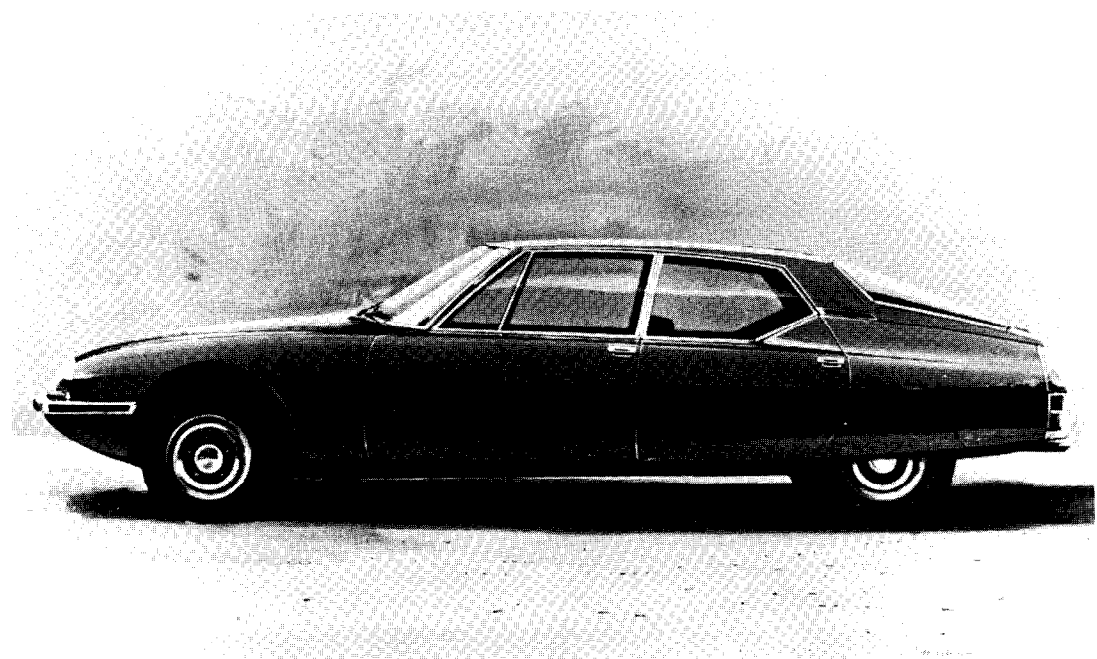
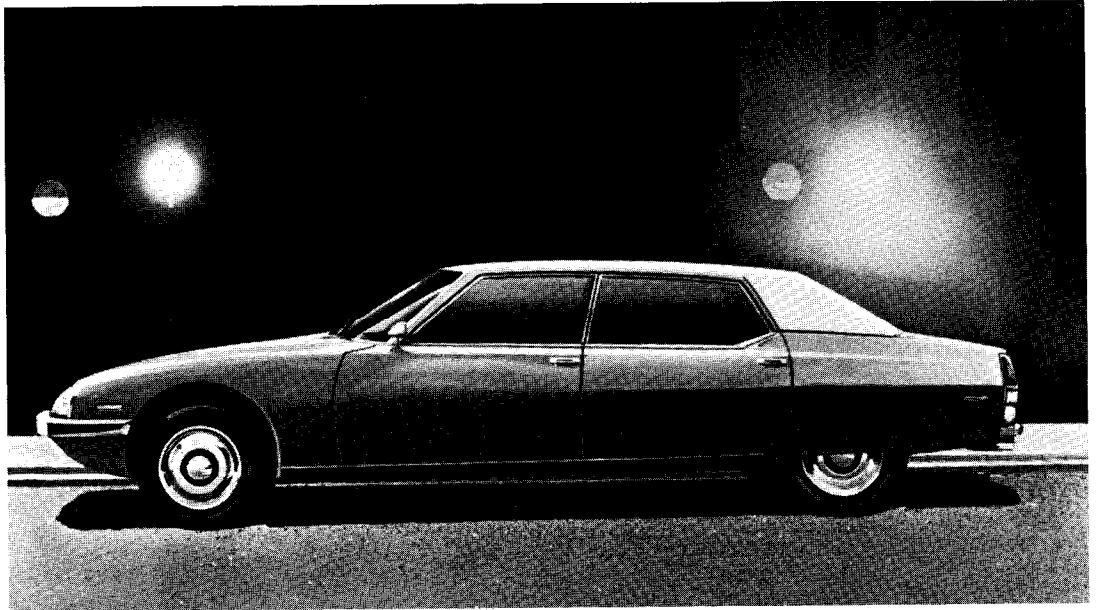
body mass was nicely balanced by the long nose. The snag was that by the time you had stretched a car that was over 16 ft long to start with, the end result was far too big and heavy to contemplate selling in Europe for any but the most special purposes. Chapron's Opera experience came in useful, however, when he was called upon to build two long-wheelbase convertible SMs for French Presidential use. The cars were delivered in May 1972, in time for the visit of HM The Queen to France.

It underlines the problems of making a convertible that while the Presidential SM was 14.5 per cent longer overall—the wheelbase was lengthened by 20.5 in. and another 7.5 in. were added by changes to the rear bodywork—the car weighed 22.8 per cent more, and this without any of the security considerations which only a few

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years later we have sadly come to take for granted. The cars were run open most of the time, though the full-length, hydraulically operated hood was fitted. Some rearrangement of the front seats was undertaken to permit the installation of a central rearward-facing third seat for an interpreter facing his two principals. Among other things, this meant shifting the steering column 6 cm to the left, and moving the hand-brake farther forward.

Considering its size, with an overall length of 18 ft 5 in., the Presidential SM was still not scandalously heavy at 35 cwt (1780 kg) and was a welcome relief from the two convertible V8 Simcas which had served for ceremonial duties since 1959. One remarkable point was that it retained the five-speed manual gearbox, since a suitable automatic transmission was not at that time available. A slightly lower final-drive ratio was fitted so that first gear pulled less than 5 mph/1000 rpm, allowing the car to be idled along without problems. The engine was left in standard form.

These special-building exercises, however prestigious, were nothing to do with the serious business of improving the SM, in so far as it could be done given the soundness of the original design and the low priority accorded to it by comparison with the GS and the blossoming CX programme. An interesting early move, showing yet again Citroën's interest in advanced technology and new materials, was the offer of carbon-fibre wheels for the SM. These were announced in July 1971 as an optional extra. As shown here, the wheels were styled with five deep 'spokes' and were less than half the weight of the standard pressed-steel wheel, scaling $9\frac{1}{4}$ lb each compared with $20\frac{3}{4}$ lb. The market did not appreciate the offer, though the wheels had been proved in

Heuliez also pursued ideas for a four-door SM, either on a much-stretched wheelbase with a notchback and conventional boot
Opposite above . . .

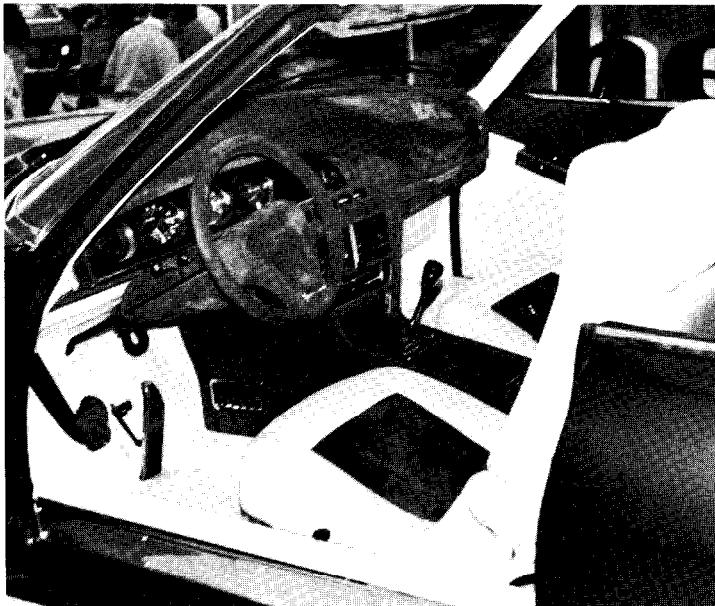
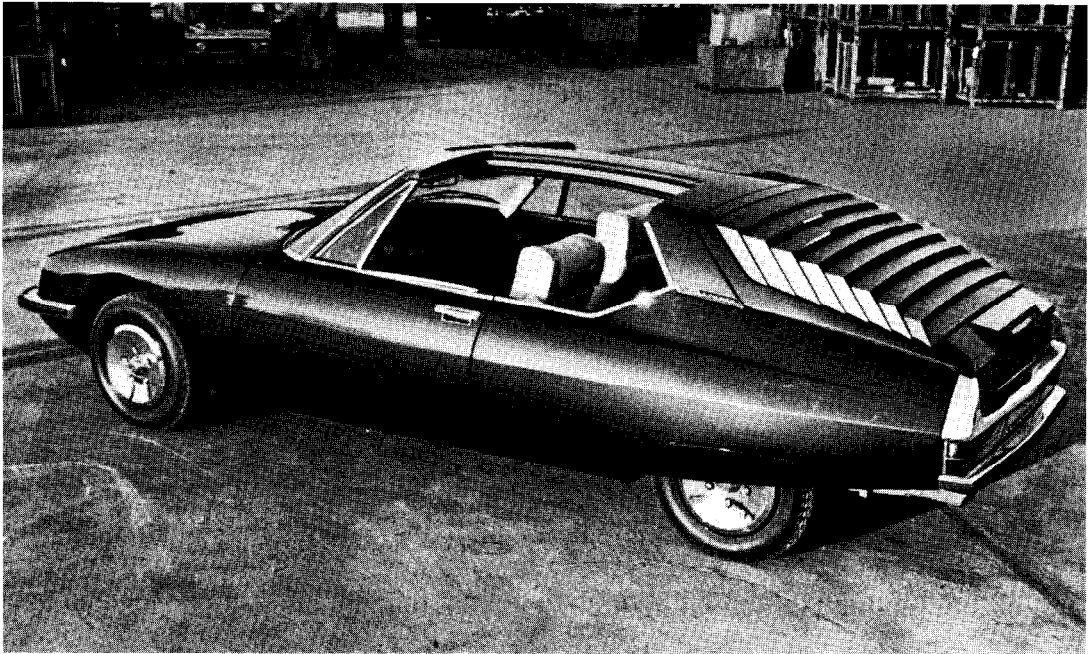
. . . or with less of a stretch (note the shorter rear window) and with the hatchback layout retained
Opposite below



Above Heuliez's earlier T-bar SM convertible with its concertina roof panels was refined—if that is the word—into the SM Espace

competition use. Alloy wheels looked much prettier. . . .

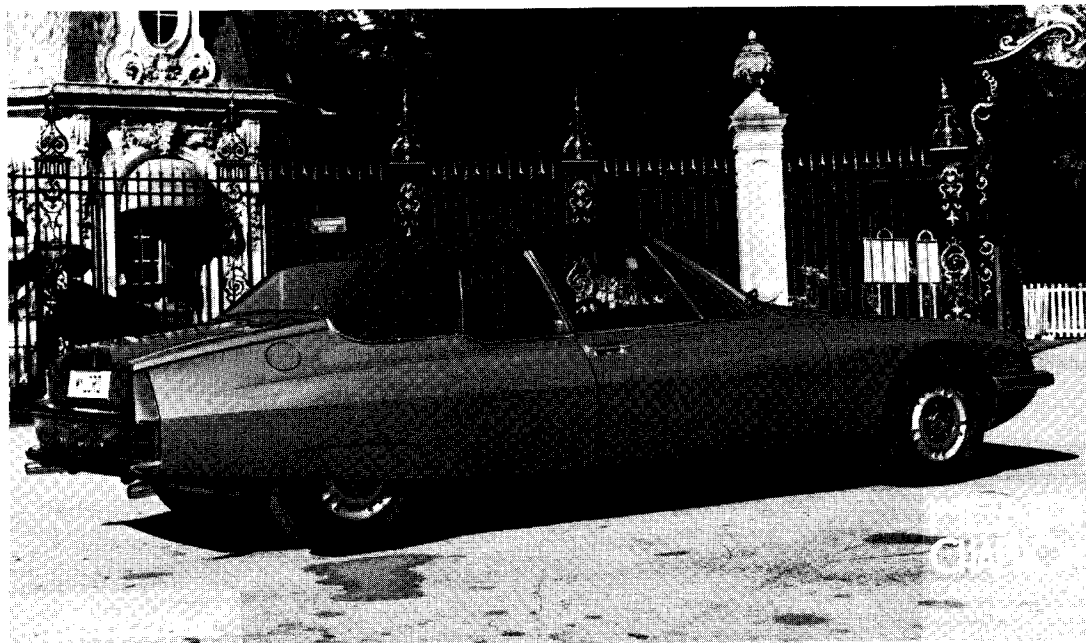
The real emphasis right through the life of the SM was on engine development, and to some extent the transmission. The search was in the first place for a system which would improve fuel consumption, which was poor at low speeds, for which the engine was over-choked, and also



Above Main styling features of the Espace were a rear window slatted over in a manner reminiscent of the Lamborghini Miura or Bertone Carabo, together with revised wheel trims. It was also felt necessary, it seems, to fit squared-off exhaust pipe trims

Left As seen at the 1971 Paris Salon, the Espace was equipped with the kind of suede-and-fleece interior beloved of French coachmakers on such special occasions

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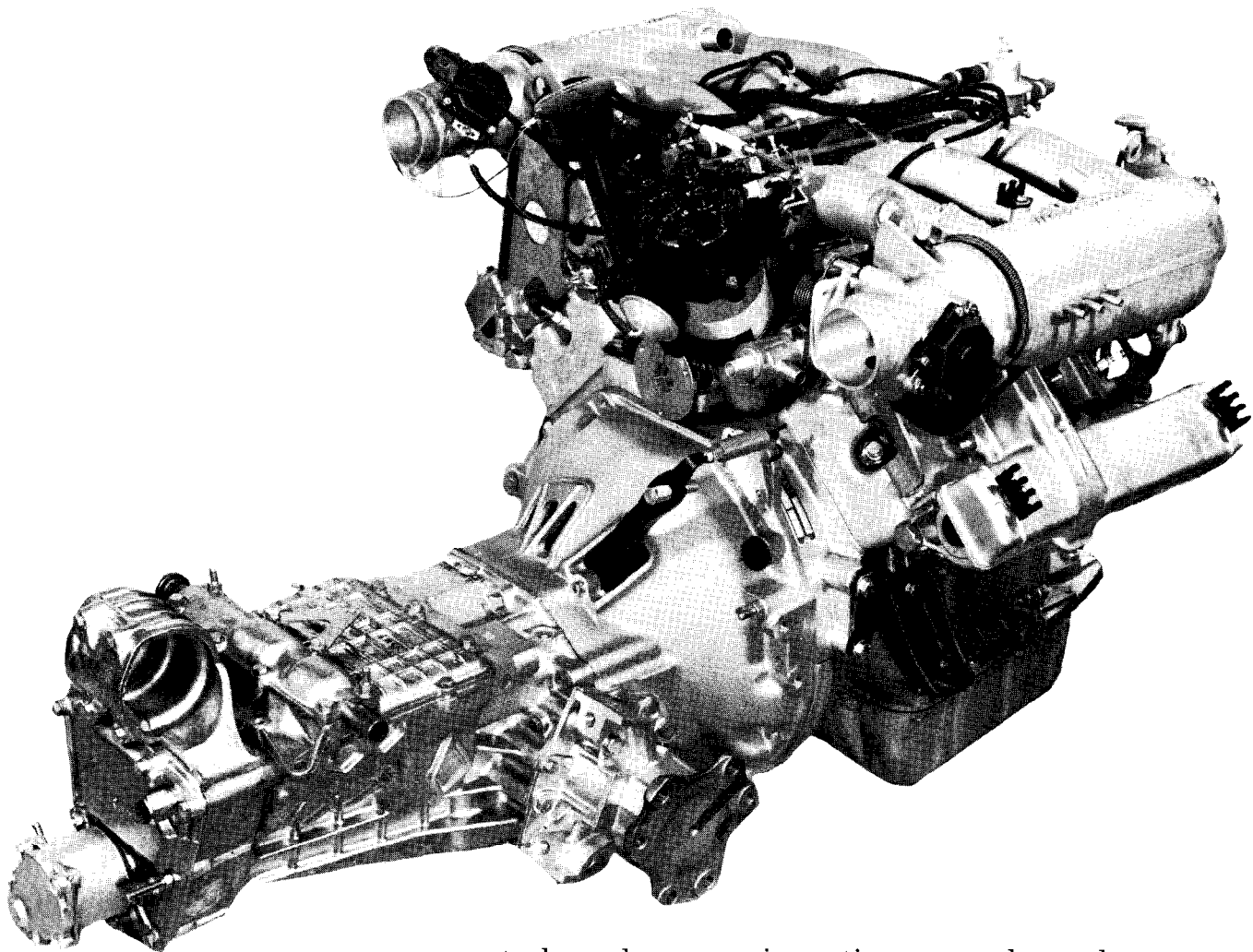




overcome the tedious task of re-tuning the big Webers. The answer was obvious: fuel injection. Citroën already had experience of the Bosch electronic system in the DS23, and they had no doubt that it was worth using in the SM, but it took time to develop it to cope with six cylinders instead of four, and the high peak output of the Maserati power unit.

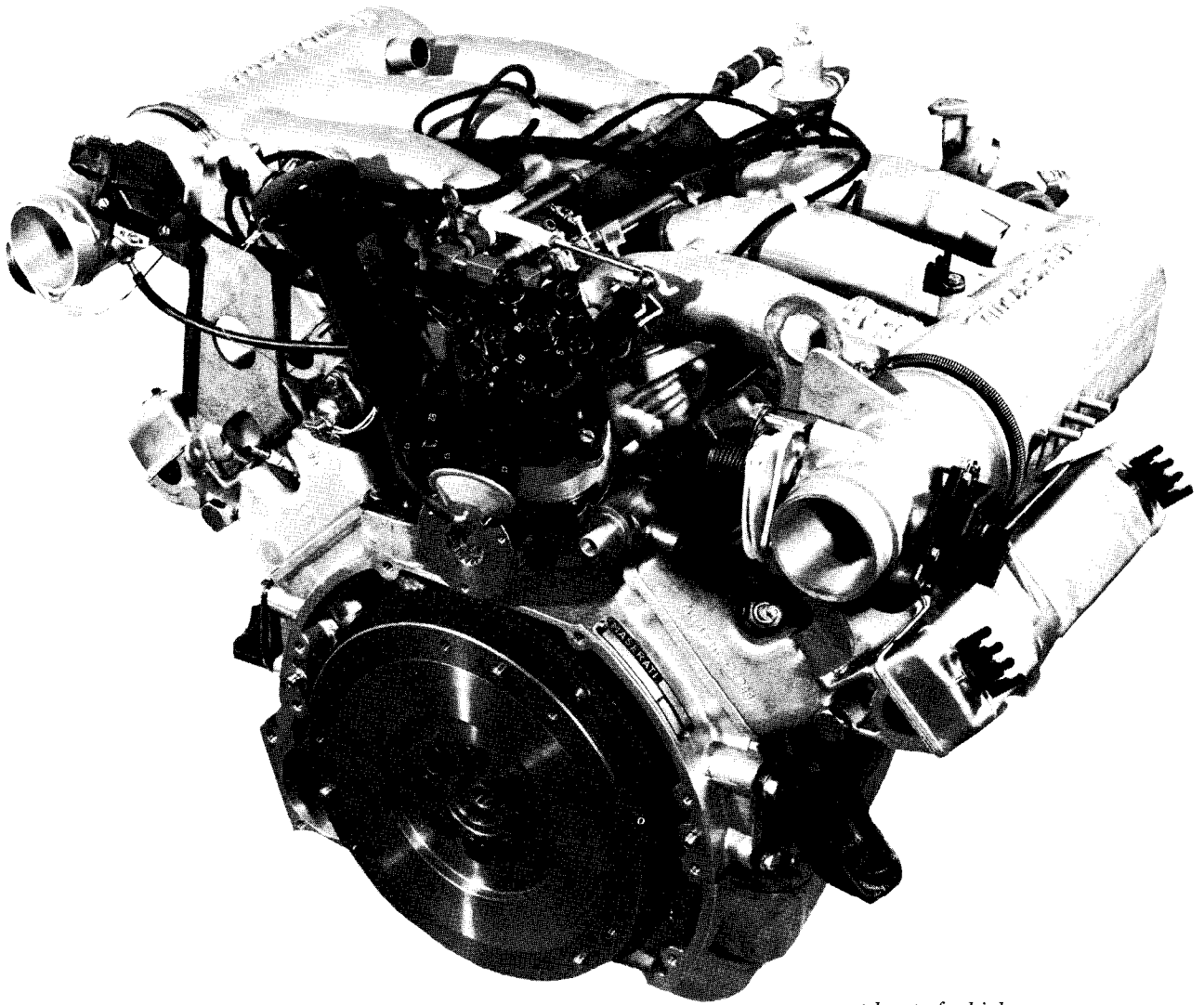
Eventually, on 17 July, 1972, Citroën announced that the fuel-injection car would replace the carburettor version forthwith. In its new form the engine carried the designation C114-03. Its bore,

Above Citroën's own development concentrated more on the purely technical side of things, as witness these carbon-fibre wheels. Despite their technical merit (they were rally-proven) the market preferred pretty alloy wheels while opposite Henri Chapron overcame technical problems and went for a fully convertible SM, christened—no doubt with a bow across the Channel—the Mylord



Slightly more power together with better fuel consumption and lower exhaust emissions was achieved with the introduction of Bosch fuel injection for the V6 engine though development was protracted and there were other problems...

stroke and compression ratio were unchanged, so the slightly increased power output of 178 bhp (DIN), or 8 bhp more than before, could be directly attributed to the injection system. Peak torque was also marginally increased, but Citroën claimed exactly the same acceleration figures. Their quoted maximum speed, however, was 5 mph more, at almost 142 mph. The reason was a change in tyre section from 195/70-15 to 205/70-15 in., giving an effective increase in gearing of 1.8 per



... not least of which was accessibility for service. The injection system plenum chambers overlay the spark plugs to the extent where removing them was a major operation, while space had to be found for the high-pressure pump and its drive

cent: bad for acceleration, but good for maximum speed, since it more closely matched it with peak power. Tyre pressures were also increased, from 32/29 psi to 34/30 psi.

Most important from Citroën's point of view, the injection engine showed an improvement in DIN touring fuel consumption from 22.6 mpg to 25.2 mpg, while the exhaust emissions—in the face of the impending ECE15 regulations—were greatly improved. Be that as it may, one thing suffered, and that was accessibility for service. It was just as well the injection system promised more consistent performance, for the inlet plenum chambers sat directly above the cylinder heads, necessitating their removal before the cam covers could be lifted. Even the sparking plugs became a minor nightmare to reach, as our comparison pictures of the carburettor and injection power units show.

Concern about the transmission centred on the US market, where the SM had been generally well received. It was assumed that Americans being what they are, the SM stood no chance of long-term sales unless it could be provided with an automatic transmission. Citroën felt—and for that matter still feel—rather awkward about fully automatic transmissions. Their engineers had sought an alternative from the first days of the DS, and when it became clear that some markets needed a proper automatic they entered into a liaison with Borg-Warner. It seems, talking to people on either side of the arrangement, that a certain strain was involved. The DS transmission needed a lot of work to get right, since it was a pioneer of the two-shaft automatic, which turned the drive through 180 degrees to return it to the differential.

At least the thing had been worked out by the time the SM arrived on the scene, and a saving

grace was that the Borg-Warner 35, which furnished the basis for the Citroën transmission, at least had the torque capacity to cope. The SM automatic worked well enough in the USA, though it failed to help the car to the kind of success that was at one time hoped for. As the US safety and emissions regulations became ever tighter in the early 1970s, Citroën decided the game was no longer worth playing. As a last resort, they tried to widen the SM's European base by offering an automatic version to sweep up possible customers who had been put off by the former manual-only approach.

Equally, it was felt necessary to provide such customers with better performance than could be obtained simply by attaching the existing automatic to the 2.7-litre engine. Instead, steps were taken to boost the power and, more important, the torque by enlarging the engine. This was simply achieved by boring out, a process made easier because, it will be recalled, the Maserati bore had been reduced in the first place to bring the V6 down to 15cv rating. Now it was opened out to 91.6 mm, taking the swept volume up to 2965 cc and the fiscal rating to 17cv.

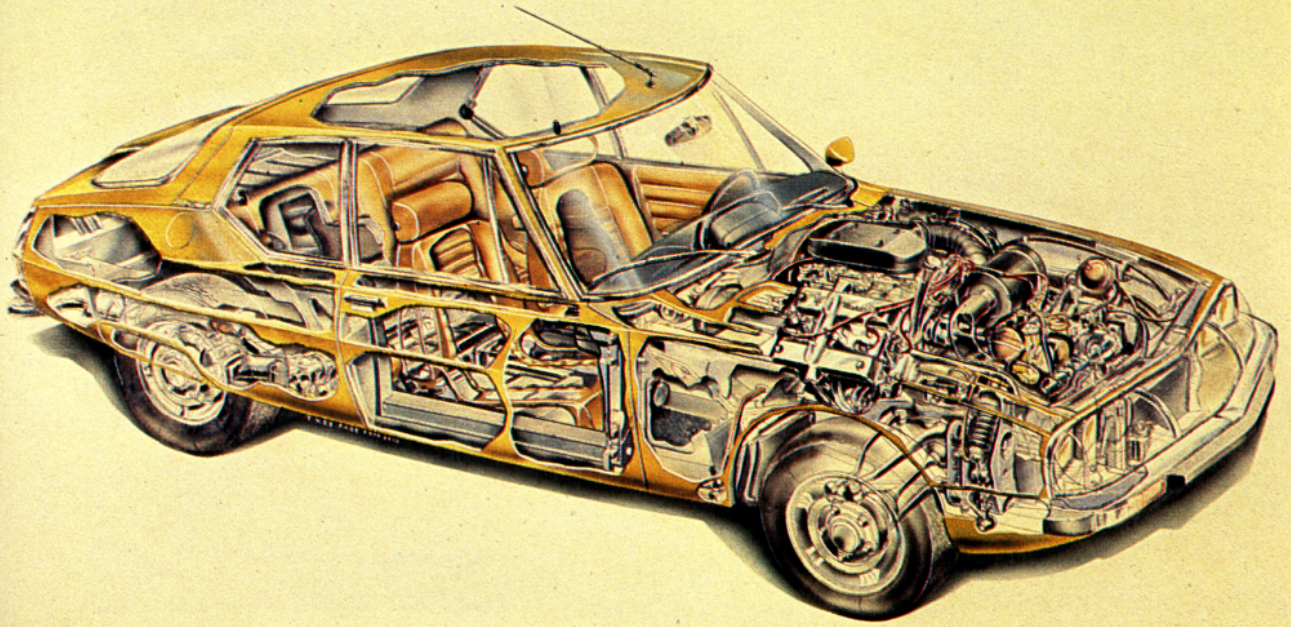
Problems were encountered in trying to match the fuel injection system to the bigger engine and the different needs of automatic transmission, and the three big twin-choke Webers returned to their former place. In this form the engine carried the designation C114-1130. Its power output was 180 bhp (DIN) at 5750 rpm, only 2 bhp more than the injected 2.6-litre, but torque was up to 181 lb ft at 4000 rpm, which was much more the object of the exercise.

Oddly, the French press release made the specific point that the red line was 6500 rpm in this case, and if this relaxation was used to the full, the maximum speeds in low and intermediate



Few would argue that its instruments sadly owed more to styling than ergonomics. The layout did not change during the life of the car which was thus always blessed with ovoid dials for the main instruments

ratios were 57 and 94 mph respectively. Top gear pulled only 20.9 mph per 1000 rpm, so Citroën's claimed maximum speed of 127 mph corresponded to 6200 rpm. This indicated a rapid falling-off of power beyond the peak, combined with considerable losses in the transmission, because a deficit of 15 mph in maximum speed compared with the fuel-injected manual-transmission car looks



Citroën's colour cutaway drawing of 1970 shows a complexity of design which has frightened many a potential purchaser, and his mechanic, away from buying. In use, the car needs skilled assistance

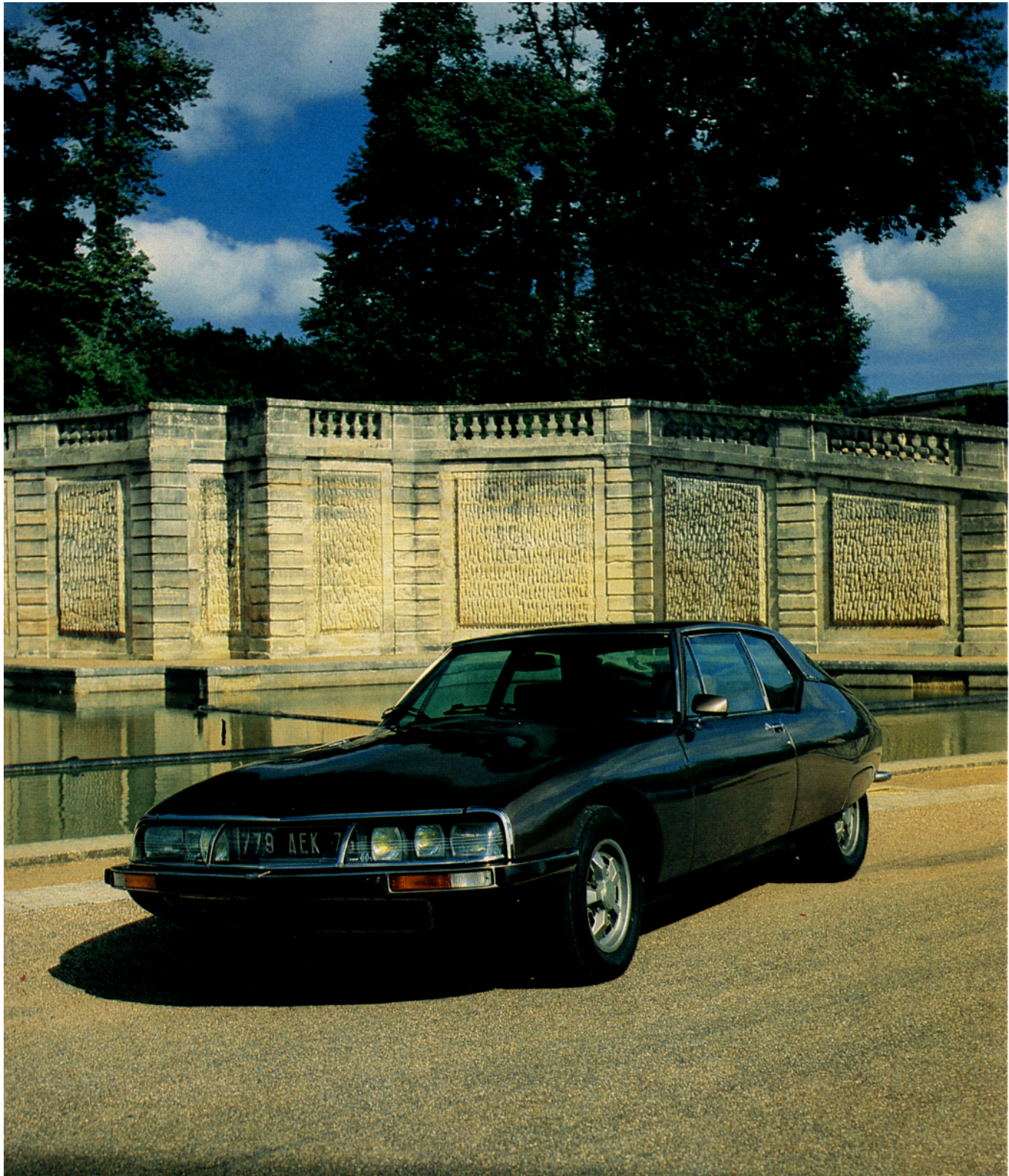


Above Sleek in appearance does not always mean aerodynamic in motion but for the SM there are both. A stunning and yet distinguished shape for this gold French demonstrator

Right The same car from the rear. Citroën have always produced curiously effective rears to their cars. Unlike the DS series there are no roof mounted indicators

Far Right Uncluttered, stylish, even 'sexy' this carbon fibre road wheel European specification SM shows off the unique headlamp arrangement and faired-in registration plate







Above No genuine Citroëniste will find anything unusual about the interior of the SM. Note the 'standard' steering wheel, button brake pedal, and voluptuous fascia curve

Right The specification changed to enable the SM to enter the North American market. The most visual concerned the front. Here's a despoiled 4 headlamp, no fairing American version





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Above This Colorado registered SM shows the American rear with its different rear lamp cluster and rear wing side marker lamps. The boot, or trunk, was cavernous

Right Automobile Quarterly photographer Neill Bruce took this typical salon shot of a UK market SM in 1974. The over-large British registration plate has yet to be squeezed under the fairing







Above Car number 2 on the Morocco Rally of 1971 driven by Deschaseaux/Plassard was victorious, followed by two DS Citroëns in third and fourth places. This car is virtually in standard trim

Right SM Presidentelle by Chapron in 1972. It featured a long wheelbase chassis, four doors but a manual 5 speed gearbox. The full length hood was hydraulically operated

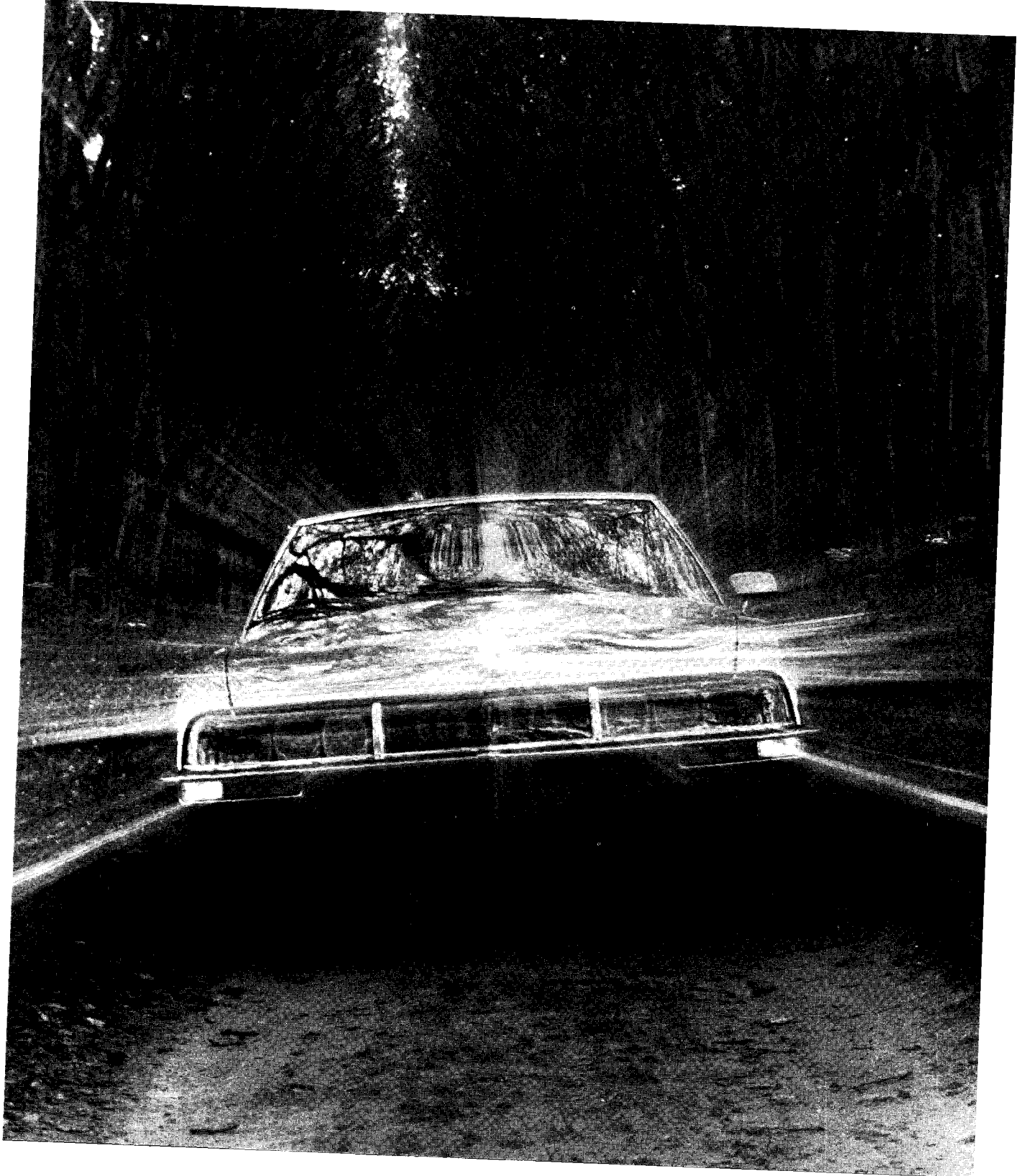


rather alarming, even with the less suitable overall gearing. Acceleration figures were also markedly inferior, the times including 10.7 sec to 62 mph (100 km/h) compared with 8.9 sec. Even worse, the DIN touring fuel consumption slumped to 21 mpg.

Perhaps understandably, no SM automatic was ever submitted to a full press road test. Not only was the performance disappointing, even on Citroën's own paper; the version was announced in France on 31 August 1973. . . .

One point of particular interest concerns the various rumours which linked the SM with the Wankel engine. There was plenty of circumstantial evidence. Citroën had a large investment in the Wankel, through their association with NSU in the Comotor concern. Then, as luck would have it, the SM's great rival for glamour at the 1970 Geneva Salon was the Wankel-engined Mercedes C111, the only car which could be considered a challenger for the SM in terms of advanced concept. It was enough to make many observers predict an SM with a three- or four-rotor Wankel.

Alas, there was no such project, and the SM was never run with anything but the Maserati V6. Citroën engineers point out that the V6 was developed specifically for the SM, that the facilities to produce it existed and could not readily be switched to anything else, and above all that the Wankel was viewed much more as a promising power unit (in two-rotor form) for medium-size family cars. This view was borne out by the appearance, in the same year as the SM, of the M35 prototype, that ugly little Ami derivative with a single-rotor engine. Later there arrived also the GZ Birotor, a GS with a two-rotor Wankel installed transversely. By that time it was 1974, and the GZ, like the SM, was overtaken by the events of October 1973.



Chapter 4

On road and track

However interesting the SM may have looked on paper, the proof or otherwise of its virtues lay in how it behaved on the road. After that first intriguing announcement in Geneva, the car did not actually go on sale in France until the end of August 1970, when the first press test cars emerged from the catacombs of the Quai Andre Citroën. In Britain interest was considerable, but there were said to be delays in converting the SM to right-hand drive. By the spring of 1971, left-hand-drive cars were trickling into the British market, but the right-hand conversion date receded into the future until finally Citroën admitted they had dropped the idea of building the car in this form.

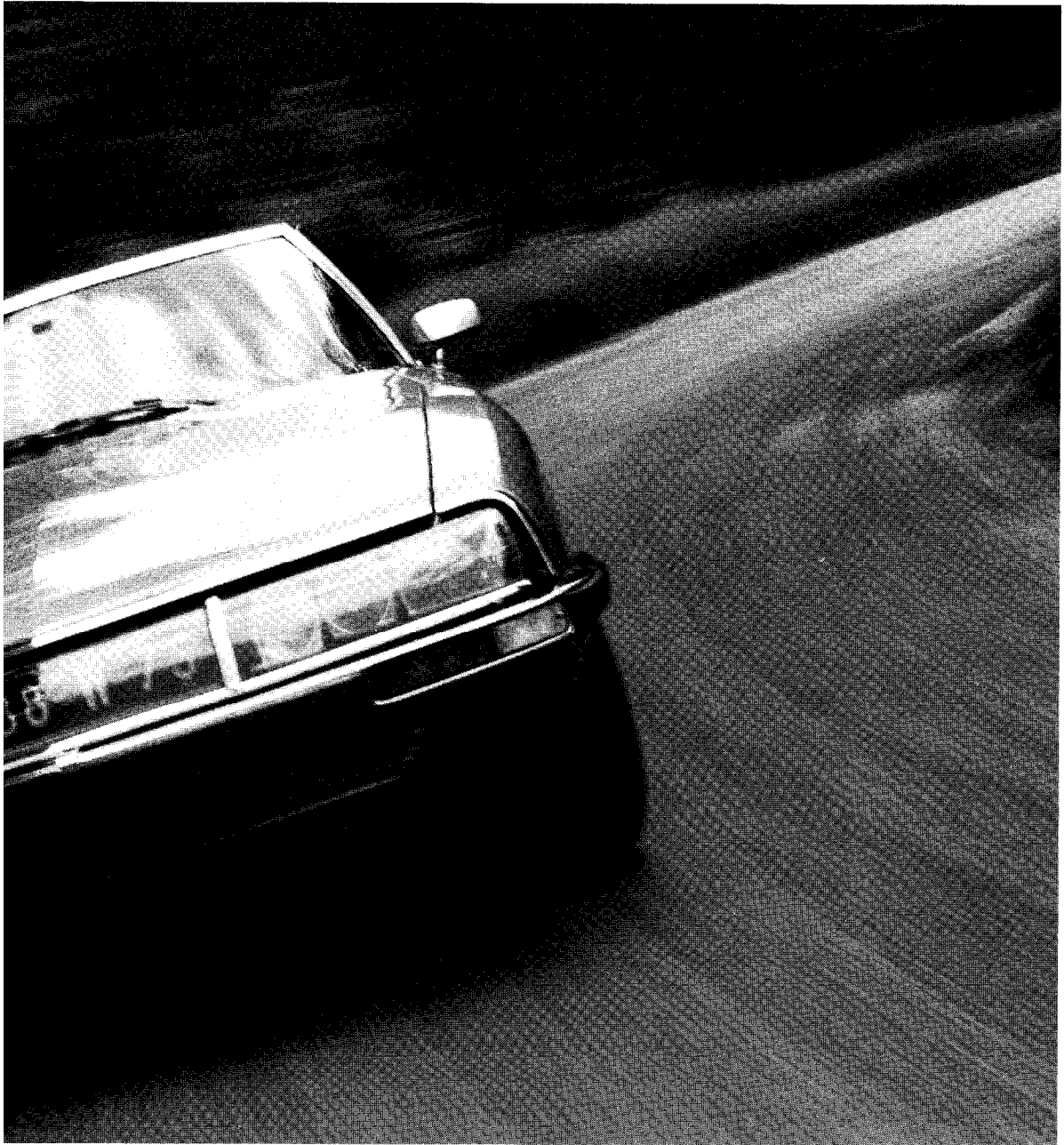
The major British motoring magazines had in any case not waited. *Motor* was quickest off the mark, sending a team to France to test an early car there, so that the report could be published in the last issue of 1970. It was a nice piece of scooping, for the rivals at *Autocar* waited until a car was ready in Britain and did not publish their test until June 1971. Even then, no price had been decided upon and both magazines contented themselves with 'about £5000 when available'.

The pitfalls of assembling a technical specification are evident in both tests, which quoted a fifth-gear ratio of 0.81. Actually it never was. What happened was that the original French press release gave the ratios in inverse form, so

Opposite Citroën's adept Public Relations Department did their best always to present the SM in its best light, producing in the process some of the most outstanding post-war motoring photography. It was hardly enough to counter growing market resistance to the car in an increasingly hostile world

Blurred-background pictures of the SM apparently cornering at great speed could not conceal what testers and owners increasingly recognized: that the SM rolled heavily and understeered to excess in hard cornering, no matter how good it was in sweeping bends. The only answer would have been an extensive revision of the front suspension, and that was too much to contemplate—quite apart from the way it would have taken the SM away from its original concept





that top gear (0.76 to us) was given as 1.321. Unfortunately, during the translation into English, a finger slipped and the figure became 1.231, giving an apparent ratio of 0.81! Both test teams fell for this—and I admit I was working for *Autocar* as a road tester at the time—despite the fact that the ratio did not tie up with Citroën's (correct) mph per 1000 rpm figures. *Autocar* compounded the felony in its 1973 test of the SM injection by talking of the engineering changes including 'the top gear being raised from 0.81 to 0.76', and solemnly explaining that this non-existent change was the reason why the mph per 1000 rpm figure had risen from 22.6 to 23.2; again the figures don't tie up, and as explained in the previous chapter it was the increase in tyre size which slightly raised the overall gearing.

By the same token, the road tests always quote a 6500 rpm red line, whereas the owner's handbook illustration clearly shows the limit at 6000 rpm and warns the driver against exceeding it. True, Citroën made a small rod for their own back by quoting a *gross* (SAE) power peak at 6250 rpm, and for that matter by publishing with their first press release power curves which ran to 6700 rpm. The truth of the matter is that while 6500 rpm was some way short of mechanical disaster, and the engine was in any case protected by the 7000 rpm bounce point of its valve springs, the handbook limit was a better guide for the owner interested in long engine life. Nor was it a bad guide to driving for best performance. Road testers have a tendency to stretch rev limits in the belief, not always justified, that better standing-start performance results. A car which approaches 60 mph in second gear may well find itself being forced to the magic figure before the gearchange to third, and the SM was a likely candidate: it would have involved using 6800 rpm



in the early car and just under 6700 rpm in the injection version.

If that were the case, the testers may have been doing the SM less than justice, for the torque curves show a fairly rapid falling-off after about 5000 rpm, suggesting that 6000 rpm or even a little under would have given the best acceleration times. This could explain the difference between Citroën's claimed standing-start time of 8.9 sec to 62 mph (100 km/h) and the *Autocar* figure of 9 sec to 60 mph for the carburettor version. As for the first *Motor* figure of 9.9 sec to 60 mph, either the car was sub-standard or the testers' chosen French drag-strip was not as level as it looked.

After a slow start, when it was vainly anticipated that right hand drive cars would one day be built, Citroën did their best to promote the SM in Britain, not least by keeping cars for press test. Here the unmistakable features of John Bolster urge one such car round Silverstone during a Michelin Foreign Car Test Day. It was hardly the best place to appreciate the SM's virtues

Both magazines agreed a maximum speed of 135 mph, close enough to Citroën's claim of 220 km/h (136.4 mph); both were rightly generous in their praise of the SM's stability at very high speed, as well it might have been with excellent aerodynamics and all that weight up front, to say nothing of the self-centring steering. *Autocar* spoke of the ease with which the car could be driven round the daunting MIRA banking at over 120 mph, a feat which in some high-performance cars is calculated to leave the crew with a few more grey hairs.

When it came to the steering and handling both *Autocar* and *Motor* failed properly to distinguish between the two. That is not altogether surprising if one considers what a new experience the VariPower steering provided. There is the inevitable comment about the way in which a driver new to the car tended to twitch about all over the road for his first mile or so. After that it is all enthusiasm about being able to fling the SM about like a Lotus Elan (*Autocar*'s simile) and professed surprise at the absence of understeer except when using lots of power out of a sharp bend.

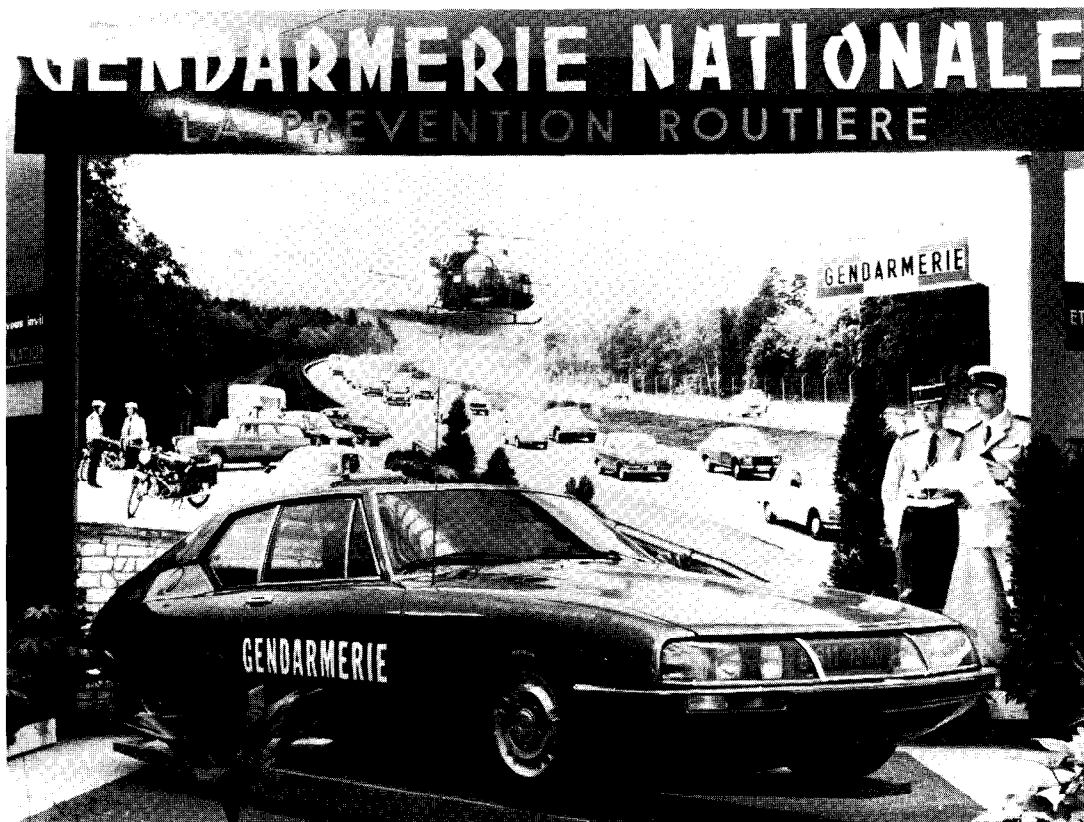
It was not so, of course. Any powerful front-driven car with 62 per cent of its weight on the front end will understeer unless something drastic is done to the chassis—joke tyre pressures, small tyres at the back or something of that sort. What was happening in the SM was that the steering isolated the driver to a much greater extent than usual from being able to appreciate the true handling characteristics. Although its artificial feel was entirely consistent, and dependent on both speed and steering-wheel angle, it was only when the transmission speed differed from the road speed—in other words, when wheelspin was encountered—that the message from the wheel read 'understeer' in the context of

all previous experience. But to understand what the SM was really doing, you had to forget about steering feedback and concentrate more than usual on external visual references. When you checked the car's attitude against its actual line through a corner, you discovered that it understeered with great consistency, and sometimes too much. Most of the crunched SMs arriving at Citroën's British service centre at Slough—and Britain is certainly not unique in this respect—bear the unmistakable signs of having gone straight on.

At this stage, I should declare my special interest. As a staff member of *Autocar*, and latterly as the magazine's Technical Editor, I was able to drive several SMs to pass through its hands. Apart from the road-test cars, one SM was loaned for a long-term test, to be run 10,000 miles or more. The nominal 'owner' was Ray Hutton, then Sports Editor and now, as I write, Editor. It was logical that Ray should have run the car, since the Sports Editor more than anyone else is committed to the kind of driving at which the SM was supposed to excel—dashing about the Continent in pursuit of the Grand Prix circus. In the nature of things, other senior staff members drove the car frequently, and one commuting journey drove me to pen the following *aide-memoire* to my colleague.

'They tell me it grows on you. I've now driven it nearly 130 miles in nearly four hours, and it hasn't even started to grow on me yet. The reasons, however, are perhaps not those you would expect.

'It would be logical to see the steering as the make-or-break factor. Certainly it takes some getting used to, and even now I find that while a smooth *entry* to a corner is easy, a smooth *exit* is much more difficult. The system is in fact too sensitive about the immediate straight-ahead



However debatable some of its features might have been, the SM was easily capable of outrunning any other French production car and indeed, on a typical autoroute, was probably capable of staying with almost any car in the world. Any slight remaining deficiency was certainly taken care of by the engine tuners of the Gendarmerie, who took to the SM with enthusiasm

position, though entirely acceptable when some lock is applied. This shows also in the slight wobble caused when the driver's hands are shaken by a bump in the road.

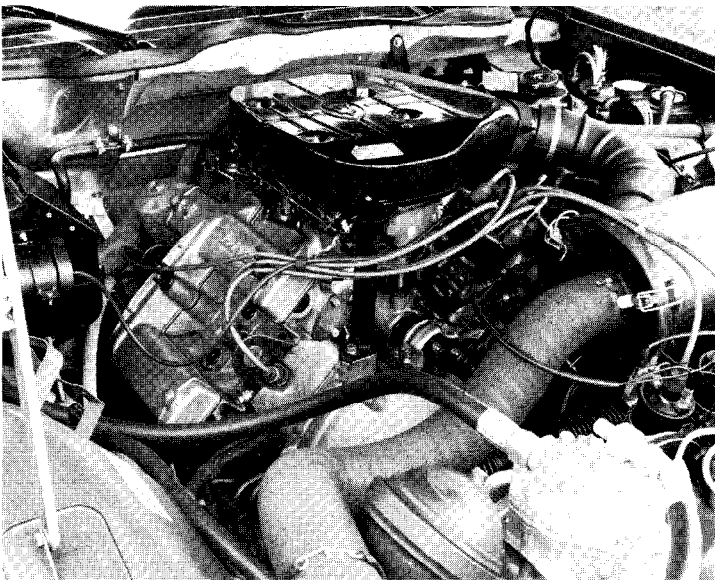
'However, that isn't why I don't like it and can't get on with it. It is BIG—so big as to make one nervous in the Sussex lanes, where I am normally confident of squeezing past anything coming the other way. This plus the left-hand drive make it a bit of a misery.

'My other major quibble is with the seat. For just sitting, it is one of the best seats ever, with support in all the right places and supremely

comfortable. But it lacks *any* kind of sideways location, with the result that in hard driving you spend all your time braced against that useful left-foot support beside the clutch pedal. By the time I arrived home last night I was pretty tired, hot, sticky (the ventilation appears to be non-existent without using the fan); and the heater is not all that strong, I found in the chill of this morning.

'For a *French* facia and control layout the thing is not too bad—familiar enough to those who know the GS/DS—but still far from good in absolute terms. Putting the stopping distance on the speedometer is a waste of paint—whatever really looks at it?

'Such lack of room in the back is appalling in such a huge car—there is more space in the Datsun 260Z 2+2. And while I think of Datsuns, the Citroën's under-bonnet layout is a nightmare, though most of the frequent-service items seem somehow to have surfaced.



The apparent tidiness of the V6 engine rapidly vanished when it was viewed under a real bonnet with its accessory drive pack (driven via the spider coupling and quill shaft seen here at centre) and the plumbing associated with the hydropneumatic system. The fact that the engine sat well back did not help, and the three twin-choke Webers were not the easiest of carburettors to keep in long-term tune

'What's supposed to be good about it? The engine is actually superb, not specially smooth but never becoming rough either, sounding like a real sports-car engine. Gearbox is good, more so considering the layout, but there is a bit of a gap between second and third for hard driving. Since it is entirely possible to start from rest in second, it would seem sensible to raise this gear to close the gap.

'The brakes are superb—very reassuring. But the handbrake is terrible, too far back in the car and needing too much effort not only to apply but to release as well.

'Handling is a mixture, superb on wide, sweeping main-road bends but terrible in the lanes, where the inside wheel lifts to slow the car (and sometimes even to bring the tail part way round).

'The ride of course is good except that some sharp bumps throw the nose in the air to come down with a crash—something that happens to all Citroëns in some measure. Also, one feels cat's-eyes and similar bumps quite sharply (you hear them, too).

'Very little wind noise—as you would expect—but that roaring, healthy exhaust note whenever you accelerate, and quite a lot of road noise all the time.'

All I should add in explanation is that the *Autocar* staff habitually write such notes to each other about test cars (a sheaf of other people's notes can be a great help when you settle down to write a test). The notes themselves are not written for publication, and for that reason tend to be no-holds-barred. In this case I think it is only fair to the reader—whatever his reaction—to see my genuine opinion of the SM at a time when it was still current. My thanks therefore to Ray Hutton, who dug this and other notes out of his SM archive. And if anyone's eyebrows are raised over

that 130-mile commuting trip, I live on the West Sussex coast, and *Autocar*'s office was in south-east London.

The more one drove the SM, the more one learned to distinguish between its handling in *bends*, where it was superb, and through *corners*, where it often was not. That first enthusiasm of the testers for the way it could be 'flung around' gradually became qualified, and people started talking about considerable roll angles. The most upsetting trait, perhaps, was that the nose would adopt its roll angle before the car really began to turn into a sharp corner. It was not the roll angle which was disturbing, more the speed with which it was achieved, thanks (as has been explained) to the front suspension having little roll stiffness and even less roll damping. The speed of the rolling motion led to another ill effect, an untidiness through S-bends as the roll angle flicked from one extreme to the other.

Just as it took time to come to terms with the high-gearing steering, so it took even longer to recognize and accept that the SM's handling in tight situations was less than perfect. As Ray Hutton eventually pointed out in his long-term test, published by *Autocar* in September 1974: 'Many of the less attractive characteristics of the front-wheel-drive layout are disguised by (the power steering) under normal conditions, including the understeer and its tendency to pick up and spin the inside front wheel . . . on slower, sharper corners its biggest disadvantage becomes apparent—the amount of roll. The car really isn't happy being driven through a series of *lacets* with verve. No sooner has the suspension caught up with the car's attitude for one corner than it is unsettled again for the next.' The softness of the suspension was counteracted by the anti-dive front suspension as far as braking was concerned,

but trailing arms do not lend themselves to a corresponding anti-squat effect at the rear, so the SM reared up almost alarmingly during a full-bore standing start.

The *Autocar* long-term test car uncovered one arguable defect of the VariPower system. If the front-wheel tracking was disturbed, as it might be by a heavy kerbing, the centre point of the steering might be shifted, and constant effort would then be needed to keep the car straight. The same effect was also found on some steeply cambered roads. Fortunately, re-centring of the steering null-point is one of the easier bits of SM maintenance and is carried out by loosening a single bolt and shifting the rack, which sits high above the final drive.

While the ride was well up to the expected Citroën standard, road noise was certainly disappointing for no immediately obvious reason. Perhaps the tyres, wider than anything Citroën had used before, were at the root of it. Lessons were learned from the SM, it seems, for the CX is much better in this respect.

The interior was very 'Citroën' with the inevitable touches of idiosyncratic styling—oval rather than round instrument bezels, for instance. At least the two main instruments were squarely in front of the driver, while the 14-function combined warning dial, reminiscent of the one in the Triumph 1300, was always partly shielded by the steering wheel rim, and the minor instruments were too small and well to the driver's right.

One good feature was that the steering wheel was adjustable for both reach and height, enabling most drivers to find a comfortable position. Quite why Citroën decided in the end not to engineer a right-hand-drive version is not clear, since the engine compartment is essentially symmetrical—no exhaust system getting in the

way on 'our' side, as has been the case in many cars with in-line engines. It seems to have been a simple question of the cost of tooling for a reversed facia and instrument panel. The seats usually elicited praise for their straight-line comfort and damnation for their lack of sideways support against cornering forces, the latter made worse if the (very expensive) optional-extra leather upholstery was specified. Air-conditioning was another extra. Proper provision had been made for it in the under-bonnet and bulkhead layout, and as a result it worked well. Though most systems in the SM were hydraulically-powered, the front windows were electric and drew the invariable comment that they were dreadfully slow in operation.

When the SM was launched, it must have seemed an obvious move to make it part of the Citroën competitions programme. It was fast, its body was very strong, it had enough room inside easily to qualify as a saloon car, and it was to be built in sufficient numbers to avoid homologation problems. At the same time, the works testers already knew about its awkward behaviour on tightly twisting roads even if it took the journalists some time to catch on. The events for which the SM was entered were therefore selected with care. The classic pattern would be a long event with stretches of rough but straight or gently winding road where the combination of speed, strength and supple suspension could tell in the long run. Many of the African rallies, from the Moroccan to the Bandama, conform to this pattern, and it was not surprising to find the SM making its first competitive sortie in the 1971 Moroccan Rally.

It was a long and tough event with a fairly small field: 59 starters for a 2700-mile course from Rabat via Marrakech and Ouarzazate to Casablanca.





However ungainly it might have been on tight Alpine roads, the SM had the strength, speed and stability to be an excellent rally car in some events. Its competition career began most auspiciously when Deschaseaux brought it to victory in the Moroccan Rally

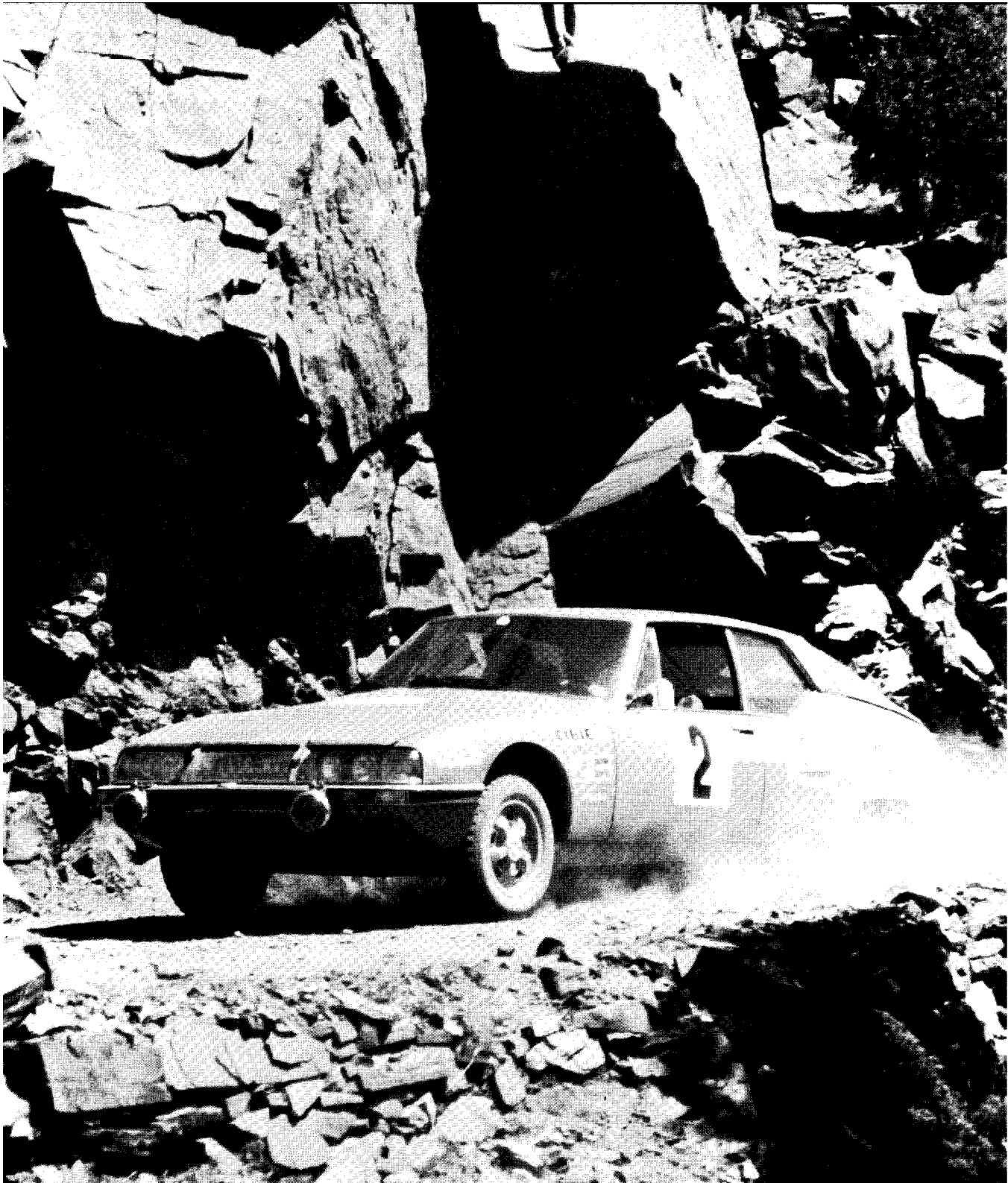
The weather in the Atlas mountains was atrocious, and the organizers had to extend maximum lateness over the first section to ensure more than a handful of survivors. Citroën had backed the solitary SM of Deschaseaux/Plassard with two DSs for Bernard Consten and Robert Neyret; but it was the SM which pushed the leading Renault Alpine of Nicolas until eventually it broke, leaving the three Citroëns firmly gripping the manufacturer's prize and split only by the Peugeot 504 of Chasseuil, which came second behind the SM.

A victory on the car's first outing must have seemed a good augury, but few events were as tailor-made for the SM as the Moroccan, and the only other notable SM success was a third place in the hard-fought TAP Rally of 1972, in the hands of Bjorn Waldegaard and Hans Thorzelius. The TAP car was considerably modified, unlike the Moroccan car, which had been effectively standard, and ran in Group 5.

By the end of 1972, Citroën's problems were closing in on the competitions department, which had to adopt an even more cost-effective attitude to the cars it ran and the events it entered. The SM was in any case dropping in the order of priorities as it failed to make its expected impact in the GT market. Had it really proved itself as a rally weapon it might just have survived in the programme, but the record was not sufficiently convincing.

Several drivers, not least in Britain, also looked at the SM's racing potential. It was the chosen transport of several racing drivers, notably Mike Hailwood, but it was Mike Beckwith who first closed his eyes to the price and sallied forth to try it on the circuits. He was not overly successful, discovering that there was no easy way of overcoming the strong understeer, which gave

The longer the rally, the rougher the roads, the more likely the Citroëns were to do well—and the SM was the quickest Citroën. The car is seen here in some of its favourite territory: the excellent standard lighting meant that only two extra lights were necessary, while the carbon-fibre wheels are evident



ON ROAD AND TRACK

Big and heavy it might have been, but the SM was strong enough to withstand the rigours of 'jumping' once it was set up to land level rather than nose-first. Here the Group 5 car does its airborne act in a Portuguese forest during the TAP Rally





the SM a voracious appetite for its expensive tyres. The only clear advantage was that its sheer complication tended to make scrutineers throw up their hands in horror and pass it without too close a look!

When the first Avon Tour of Britain was run in 1973, *Autocar* entered an SM to be driven by Howden Ganley, with Ray Hutton as his co-driver. Their pre-event testing likewise concentrated on taming the understeer, and Ray lent

Below Few people seriously tried to race the Citroën SM, put off by its cost as well as the problems involved in taming its natural understeer and voracious appetite for

front tyres. Mike Beckwith was one of the few who believed, at least for a time, that its straight-line speed was enough to overcome its drawbacks and achieve

success in the saloon-car classes. This photograph is typical of those shot by Gerry Stream from the trackside at Brands Hatch





me his notes on some Silverstone testing (with the Beckwith car) which may be of interest to current SM owners. Since this was a carburettor car, its standard tyres were the 195-section ones. Run at raised pressures of 38/34 psi, the best lap of the Silverstone GP circuit was 2 min 8.5 sec.

A switch to the 205-section tyres, with the rear tyre pressure dropped to 30 psi in an attempt to encourage the tail wider, gave an improved lap time of 2 min 6.8 sec, though it was noted that the inside front wheel frequently lifted and spun, and that the understeer remained strong. Raising the pressures to 44/32 psi proved the best compromise, giving a lap time of 2 min 5.8 sec with reduced understeer but a feeling of reduced stability under braking. Raising the front tyre pressures to 50 psi, the maximum permitted for the XWXs, did nothing further to improve the understeer—almost certainly because the tread was becoming convex and narrowing the contact patch—but greatly increased the rate of front tyre wear. To put the performance in perspective, the quickest re-

Valiant try—Howden Ganley and Autocar Sports Editor (now Editor) Ray Hutton with their Group 1 car for the Avon Tour of Britain. As Ganley said when they finished well down the lists: 'At least we know why people don't race Citroëns!'

corded lap gives a speed of 83.8 mph, by no means bad for a 2.7-litre standard production car weighing nearly a ton and a half. It has always been a small personal ambition of mine to lap Silverstone in under 2 minutes; it is daunting to think I must find something decidedly quicker, or better handling, than the SM.

The Ganley/Hutton car did not do well in the Tour of Britain. As Ray Hutton said afterwards: 'The car had proved less competitive than we had hoped and more difficult to handle than we had anticipated. I remember asking Howden what he thought we had learned from the exercise. His answer was succinct: 'Well,' he said, 'now we know why people don't race Citroëns.' With hindsight, it was a pretty rotten thing to do to a fine car, which, like all Citroëns, had been designed with a clean-sheet approach to meet certain specified conditions. Those included the need for quiet, high-speed cruising, a superbly comfortable ride over all sorts of surfaces and a very sophisticated power-steering system. But they did not include racing.'

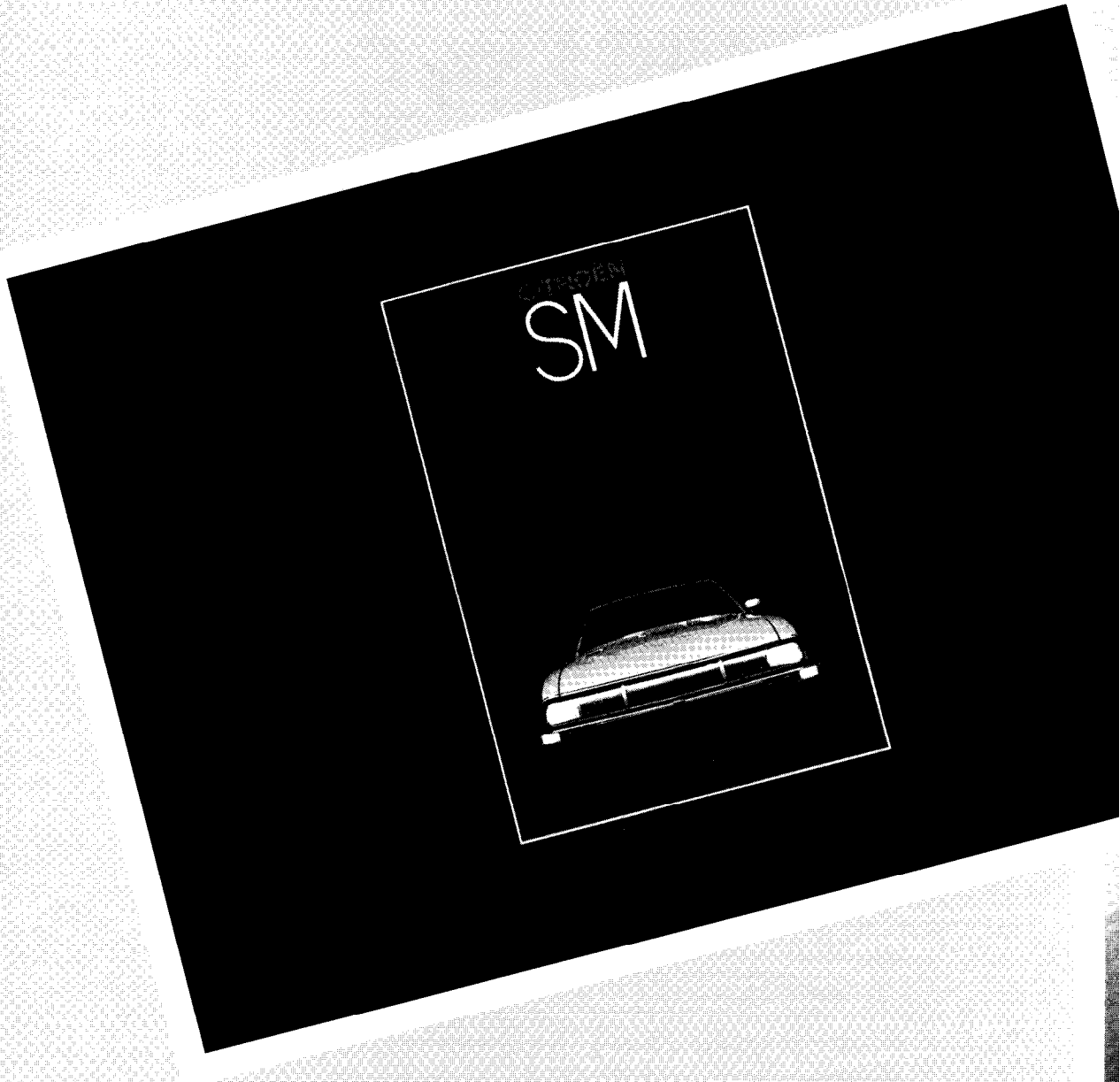
The later fuel-injection SM was eventually tested by both *Autocar* and *Motor*. *Autocar* found a higher maximum speed, at 139 mph, but marginally inferior acceleration, with 9.3 sec for the standing start to 60 mph. Fuel consumption, however, improved from 16 mpg to 17.9 mpg—not much when you say it quickly, but actually a 12 per cent gain. But it was left to *Motor* to set the best SM figures with their test of December 1973, with a maximum speed of 140 mph and an impressive 8.3 sec to 60 mph. For the road testers, that was more or less the end of the SM, for the 3-litre automatic never materialized, at least in Britain.

Chapter 5

Production and marketing

In the early 1970s, life and the future of the motorcar, even the big and thirsty motorcar, looked rosy. Citroën was not alone in its headlong expansion: the company built over 600,000 cars for the first time in 1970, and over 700,000 in 1972. All too few of these cars were SMs. Our table shows the annual breakdown of SM production, and reveals that 1971, the first full year of production, was also the best year. After that it was downhill all the way, with the slide gathering momentum until the model's demise in 1975.

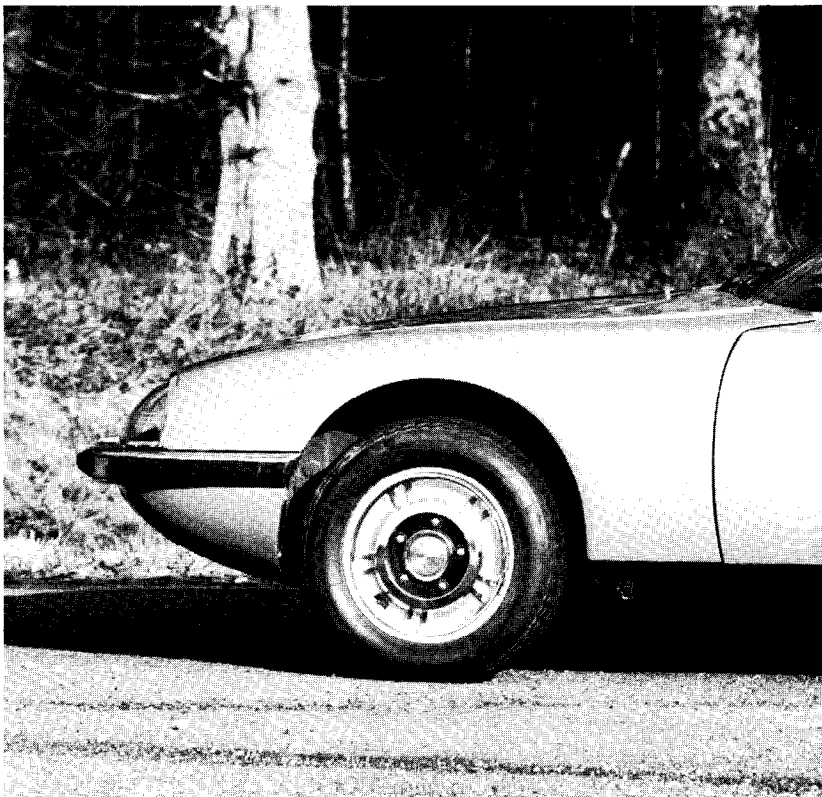
Why so? A look at the detailed sales figures is illuminating. Any new car, especially an exciting one with an advanced specification, enjoys a honeymoon period when every enthusiast, and boastful would-be-enthusiast, wants one. This was certainly true for the SM in 1971, when 2770 SMs were sold in France alone, together with 922 in Italy (the Maserati connection went down well there) and 513 in West Germany. From that point on there was a decline. French sales in 1972 were 1425, little more than half those of the year before, and it was the same story in Italy and Germany. Citroën were themselves largely to blame because the home and EEC market was neglected in favour of an all-out assault on the upper echelons of the American market. Thus 1972 was the peak year for sales in the USA (1128) and Canada (237).



Taken from the English sales brochure they made it look beautiful (it was, especially from the front) and they made it look fast . . . that was the consistent sales message that pushed the SM. Would any other have worked better? Probably not



The profile that in a kinder world might have been a success: this production SM makes an interesting comparison with the wind tunnel model shown earlier. The shape of the tail was always a styling sticking-point, and many attempts were made, on paper or in the metal, to arrive at a better solution. The problem was to make it prettier without spoiling its undoubted aerodynamic efficiency



Suitable encouragement for this effort came in January 1972 when the US motoring magazine *Motor Trend* voted the SM its Car of the Year. The implication was that the SM was something quite remarkable, because it was almost unheard of for the award to go to anything but an American car.

The crest of the wave passed underneath the SM very quickly, in part because of the sheer weight of the USA's safety and emissions laws, but also because a car as specialized and complicated as the SM demanded something special in the way of service back-up, and it didn't always get it. The falling away of American sales just when they were expected to build up was a major



blow, and to all intents and purposes sealed the SM's fate.

The switch to fuel injection for the European market half-way through 1972 also took its toll of production. Although the injection version was arguably superior, some 8000 of the near-13,000 SMs built were carburettor-equipped.

In 1973 the French market slipped to little more than half what it had been the year before, let alone in 1971, which meant that even the home base was being cut from under the car. The Italian and Swiss markets held up better, but the important German one virtually collapsed with just over 100 cars sold. Oddly enough, 1973 was the





The Maserati factory in its heyday. In the foreground, SM gearboxes being assembled. At the extreme right, a built-up SM power unit and behind it, a V8 Indy engine. The capacity, equipment and workforce of the factory show why Alfieri had such high hopes for Citroën's use of it—but Citroën's motives for the takeover were mixed at best

best year for SM sales in Great Britain with 159 cars registered. The British, it seemed, had finally come to terms with the idea that they were never going to get a right-hand-drive SM, so they might as well buy it anyway if they were that keen. It is interesting to speculate how many more SMs might have been sold in Britain if a right-hand conversion had been proceeded with: the answer, sadly, is not nearly enough to have saved the car. As it was, even without the events of October, which came too late to affect what should have been a boom year (and was, in other respects: Citroën built over 750,000 vehicles), SM production slumped to well under 3000.

The programme had lost its way. The retreat from America had been abrupt, and the neglected European market had lost its enthusiasm for the SM. The October war and the steep rise in fuel prices, coupled with the near-universal arrival of speed limits, was the final blow. A considerable investment would have been needed to re-launch the SM, for extremely doubtful returns. Citroën could not afford it. In 1973 Fiat had pulled out of its Pardevi partnership, and the storms of the energy crisis drove Michelin to cede control of Citroën to the stern financial dictates of Peugeot, in a deal concluded in December 1974.

Citroën meanwhile had tried to reduce the burden of their embarrassing masterpiece. In April 1974, an odd announcement came from the Citroën press office in Paris concerning an 'agreement between Ligier and Maserati'. It pointed out that the Ligier JS2, equipped with a Maserati engine, had done well at Le Mans and in the Tour de France, and went on (the translation is mine):

'Out of this situation emerged, and is today accomplished, a logical agreement between Maserati and Automobiles Ligier, both companies with a sporting outlook, seeking their customers



among connoisseurs and enthusiasts. Clearly such an agreement allows Automobiles Ligier, linked to a specialized small-series constructor like Maserati, to retain its identity *while becoming part of the Citroën group.* In other words, using Maserati as an intermediary, Citroën had bought its way into Ligier's small and efficient operation at Abrest, near Vichy. The purpose was hardly hinted at even in the final paragraph: 'Eventually, the industrial collaboration between Automobiles Citroën and Maserati for certain small-series operations, can in the future be extended to Automobiles Ligier.'

Those who studied this coy announcement were left to work out for themselves that the 'small-series operation' involving collaboration between Citroën and Maserati was in fact the SM,

She was, of course, lovely . . . she was also small enough to have the driver's seat some way forward, lending the back seat an impression of space it did not altogether deserve. Note also the flatness of the seats which led to many road-test complaints about lack of lateral support in hard cornering



The cockpit—although perhaps consciously, Citroën's styling fought against the idea that a GT car should resemble the stark functionalism of an aeroplane. Note the adjustable steering column and the wide, positive gate for the gear lever. Positive ventilation however is left to two small eyeball inlets at either end of the fascia—some way short of 1980 standards

and that arrangements had been made to move SM body production and final assembly from Paris to Abrest. In this way, taking advantage of Ligier's lower overheads and enthusiast contacts, it was hoped to keep the SM alive, if only just.

The transfer took a long time to arrange, and in 1974 total production amounted to 294 cars; the tail-end of Paris production, and the first 21 Abrest-assembled units. Then at the end of the year came the Peugeot takeover, which involved the whole of Citroën being subjected to microscopic financial scrutiny. The object was to ensure that no operation survived unless it was self-financing. The SM clearly was not. On the other hand, the vestiges of the project were tucked

away down at Abrest, and nothing remained in Paris to remind the new masters of its existence. One car which had lingered at Javel for recertification was hastily bundled out of the door, and sales in France were actually stopped. French SM registrations finish with the 159 cars of 1974. Abrest quietly went on assembling cars, completing 114 'for export only'. But the Peugeot accountants were very thorough and Nemesis soon descended. Maserati was officially shed on 22 May, 1975, to undergo agonies before de Tomaso came to its rescue; and since the agreement with Ligier had been concluded through Maserati, there was no mechanism through which SM production could continue. Citroën put a final request to the group management that the remaining SM body shells in stock—rumoured to amount to several hundred—should be completed as cars. The reply was an order to send them to the crusher. The SM was dead.

Where should today's enthusiast look for an SM? The answer is almost anywhere. Britain was far down the eventual league table of SM sales,



Here she is again—and doesn't she make that back seat look roomy? In this case the folding centre armrest helps with lateral location, although the fixed angle of the backrest didn't suit everyone (and neither did the limited headroom)

and only 327 cars were ever officially registered here, a smaller total than in Belgium/Luxembourg. France itself, as can be seen from our tables, retained the most, although the majority of these are early models. The only other countries where sales ran into four figures are Italy and the USA. Given the present price of petrol in Italy, plus the nervous reaction against large, conspicuous cars following the surge in the popularity there of kidnapping, that might be the first place to look. . . . Further afield there are (or were) cars to be found in most of the countries of the old French empire, while 134 SMs—an impressive total, all things considered—were registered in Japan. One thing is certain: there are few enough surviving SMs in the world, and sufficient appreciation of its unique appeal, to ensure it true classic status.

For the record, SM prices in Britain ran as follows:

November 1972	£4420 basic, £5342 with tax
August 1973	£4597 basic, £5478 with tax
October 1973	£5200 basic, £6197 with tax
October 1974	£5719 basic, £6679 with tax

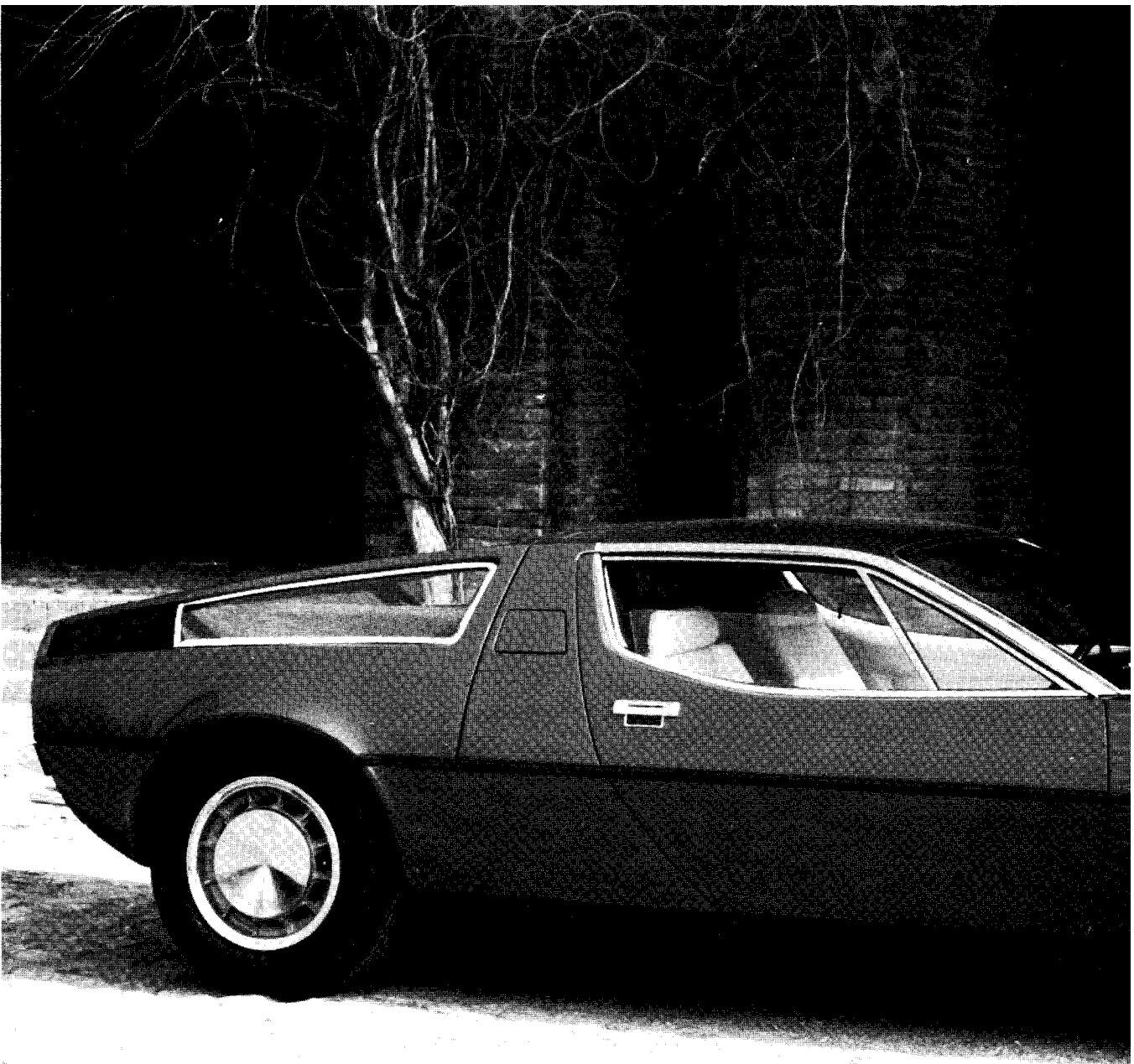
Prices now range from perhaps £1700 for a poor 1972 carburettor car to the £7000 recently asked for an immaculate 1974 injection model. There is no doubt which way the prices will go. What would an SM cost today if it had remained in production? It is possible to use the price of another Citroën model, say the GS Club, as a guide. In October 1974 the GS cost £1466 tax paid; now, at the time of writing, it costs £3633. That would make the tax-paid price of a new SM £16,552. . . . An interesting comparison with, shall we say £18,538 for a Jaguar XJ-S or £17,534 for the Ferrari 308 GT4 2+2.

Chapter 6

Sowing the seed

While Maserati's contribution to Citroën following the agreement of 1968 was important and obvious, it overshadowed Citroën's reciprocal contribution to Maserati. In 1968 Maserati had fallen rather into the doldrums, suffering by comparison with Ferrari as well as the upstart newcomer Lamborghini. With de Tomaso and Iso also weighing into the prestige end of the Italian market, it began to look a crowded little arena. Maserati, electing to make the change from their former in-line six to the bigger range of V8s for the Mexico/Indy and the first ugly Quattroporte, found themselves caught between two stools. Their new power units had neither the cheap convenience of Iso's and de Tomaso's off-the-shelf American 'musclecar' engines, nor the glamour of the Ferrari and Lamborghini V12s. They regained some prestige with the Ghibli, a styling *tour de force*, but Citroën's innovative engineering offered a better chance of long-term success.

The problem was that Citroën steering, suspension and brakes can hardly be adapted to an existing chassis, while the V6 engine for the SM—which Maserati were of course entitled to use in their own right—was not altogether suitable for the heavy, front-engined, rear-driven GT cars of the existing range. To begin with, therefore, Maserati's main benefit from the link with Citroën was the use of Citroën sales networks, where appropriate, to try and boost sales to an



The mid-engined Bora, though V8-engined, was conceived during Citroën's stewardship of Maserati and leaned heavily on the French company's aerodynamic expertise: it proved fast, and also extremely stable at high speed which could not always be said of some rivals



economic level. In Britain, for example, Citroën's HQ directed Maserati sales, and a handful of press test Maseratis were added to the Citroën press fleet.

It was decided that a new Maserati range would be created, consisting of three basic chassis. The first would be a compact mid-engined sports car; the second would be a front-engined GT making use of some Citroën systems; and the third would be a four-door prestige saloon, the Quattroporte II, based entirely on SM running gear.

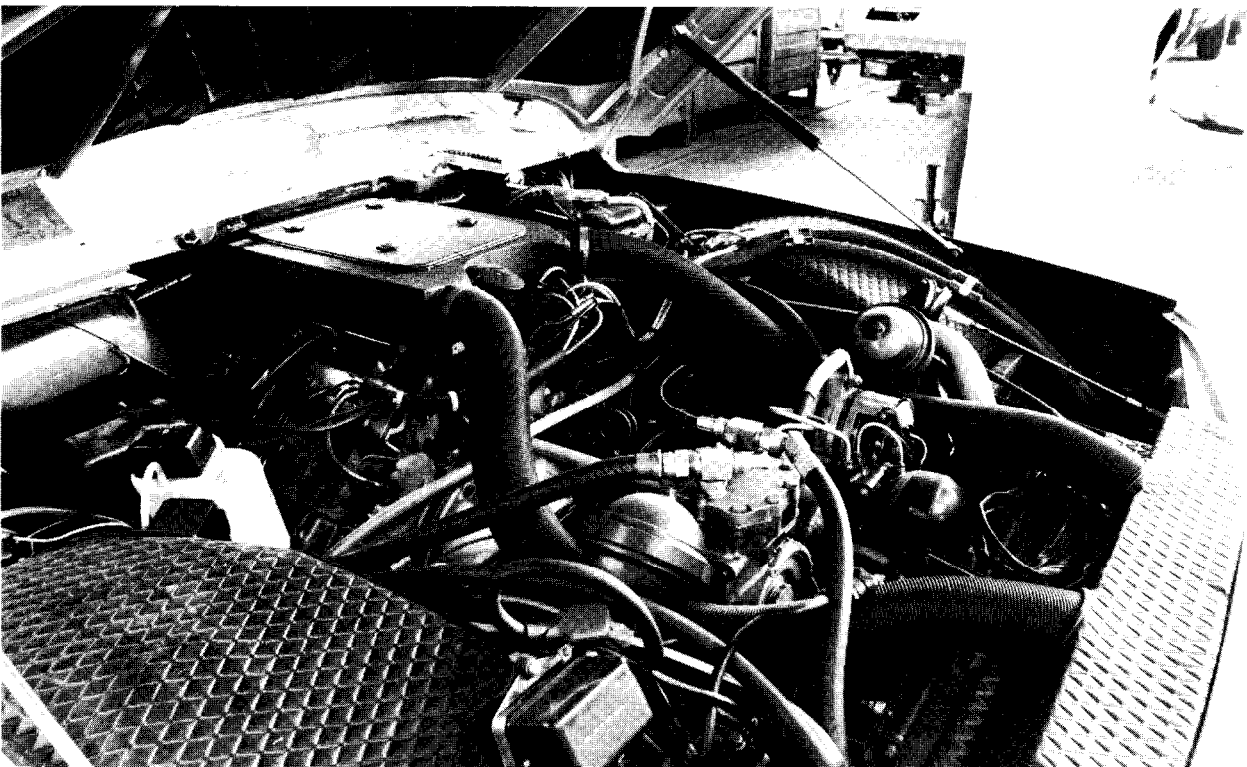
The sports car was the first to emerge in the form of the Bora, apparently owing little to Citroën but drawing benefit from the aerodynamic expertise of the French. This was fairly important, because the Bora was Maserati's first essay into mid-engined design, and its lowdrag shape gave it a maximum speed of well over 160 mph on the 310 bhp of its 4.7-litre V8. The Bora was followed in 1974 by the Merak, a car which clearly owed a lot more to certain aspects of the SM. For one thing, the 3-litre version of the V6 was used, mildly tweaked by Alfieri to produce 190 bhp at 6000 rpm (compared with 180 bhp at 5750 rpm for the SM itself). The five-speed SM gearbox was also used, retaining its characteristic top two 'overdrive' gears, but the final drive was a hypoid unit rather than a simple spiral bevel. More interesting still, the SM full-power braking system was used, with a single-plunger engine-driven pump and hydraulic accumulator.

The reduced length of the SM engine meant that while the Bora had been very much a two-seat car, the Merak could at least make some pretence of 2+2 accommodation, though the small rear seats backed directly onto the main bulkhead, with consequently bolt-upright squabs. Although the Merak had 120 bhp less at its disposal than the Bora (in other words, 39 per cent



less power), the lighter engine and drive train meant a weight saving of almost 600 lb, which meant the deficit in performance was not as great as might have been expected. In its *Autocar* test, the Merak reached 60 mph from rest in 8.2 sec, compared with 6.5 sec for the Bora; a gap that might have been narrowed if the Merak (and the SM, as already explained) had been capable of reaching 60 mph in second gear—which the Bora

By installing the shorter V6 engine in the Bora, Maserati achieved a lighter car and gained enough extra space to instal two very occasional back seats . . . hence the Merak, seen here in smaller-capacity 2-litre form to sell in the tax-conscious Italian home market



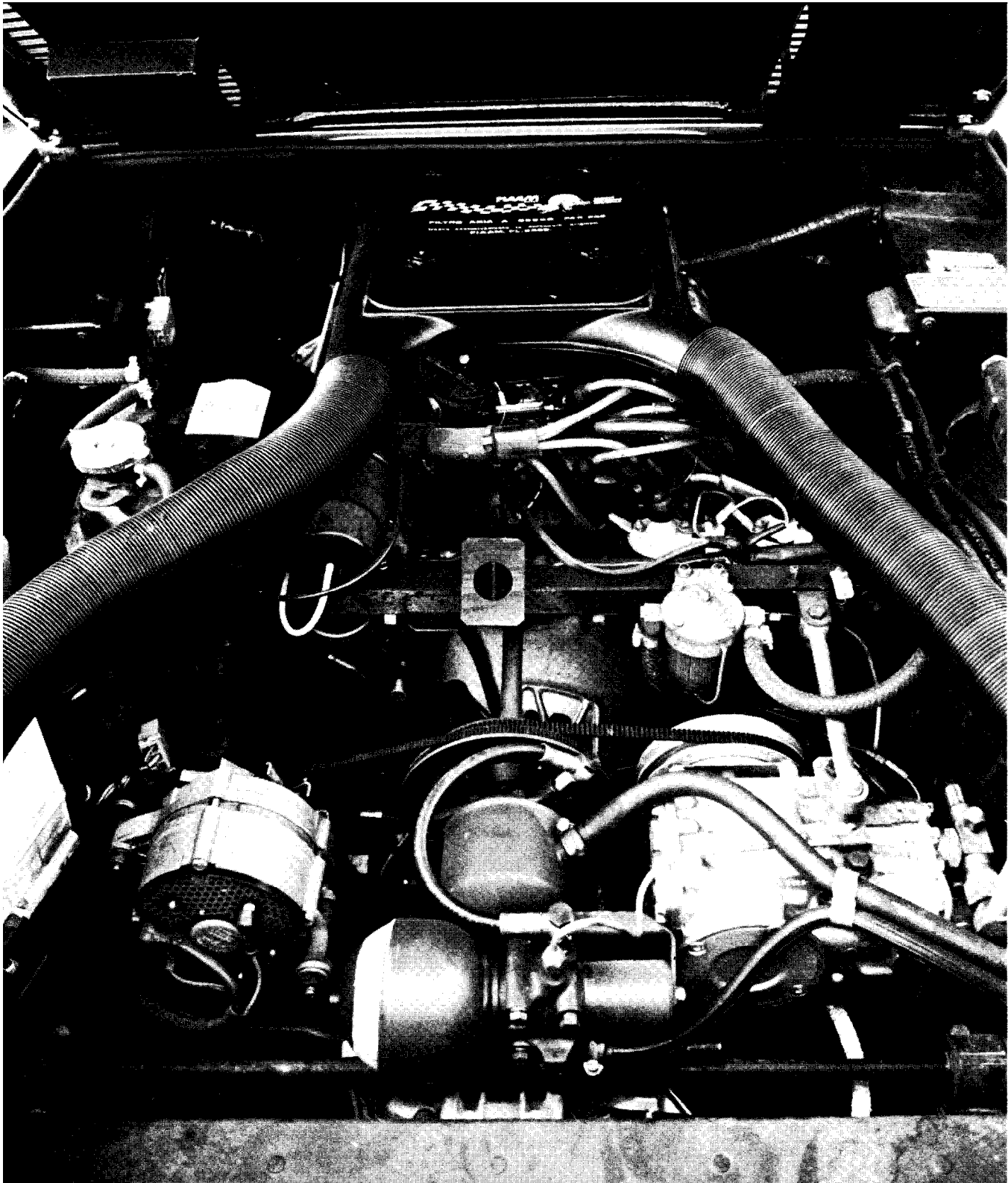
Above Not an SM engine compartment, though it might almost be: Maserati's Quattroporte II was intended to use most of Citroën's SM running gear including the hydropneumatic suspension

Right Less extensive use of the Citroën high-pressure system was seen in the Merak, with its single-plunger pump and accumulator to serve the braking system

was, of course. The power difference meant more when it came to top speed, down to 135 mph for the Merak.

The Merak was a good move for Maserati, for it made a strong and direct competitor for the other 'mini-supercars' thrown up by the energy crisis, the Ferrari Dino 308 and the Lamborghini Urraco. Thanks to its excellent shape, it returned good steady-speed fuel-consumption figures too, still managing 21 mpg at 100 mph. Since it retained the Bora's 85-litre (18.6 Imp. gallon) fuel tank, this meant that restrained driving could achieve a 400-mile range.

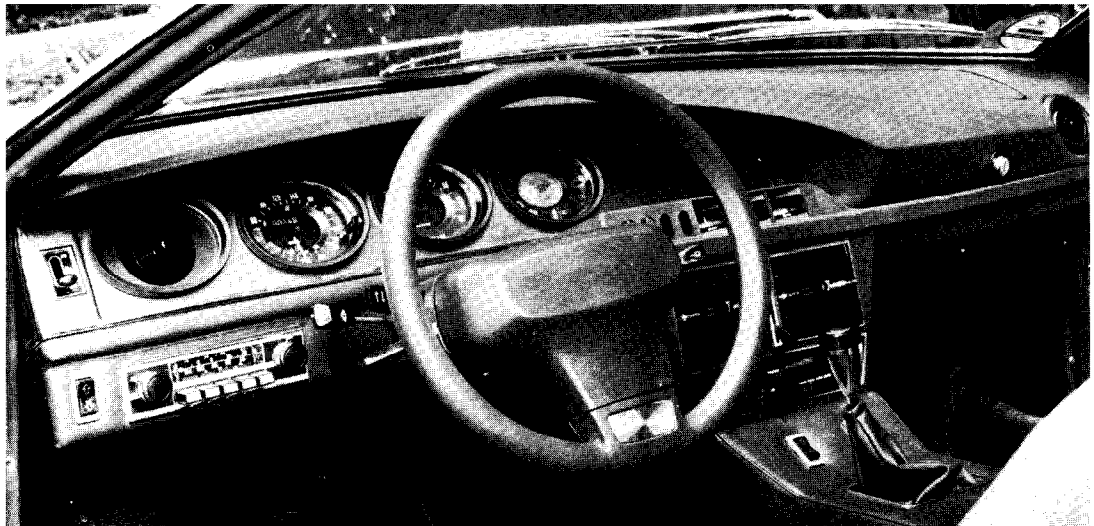
The SM brakes did not prove popular in the Merak, because the firm suspension and con-

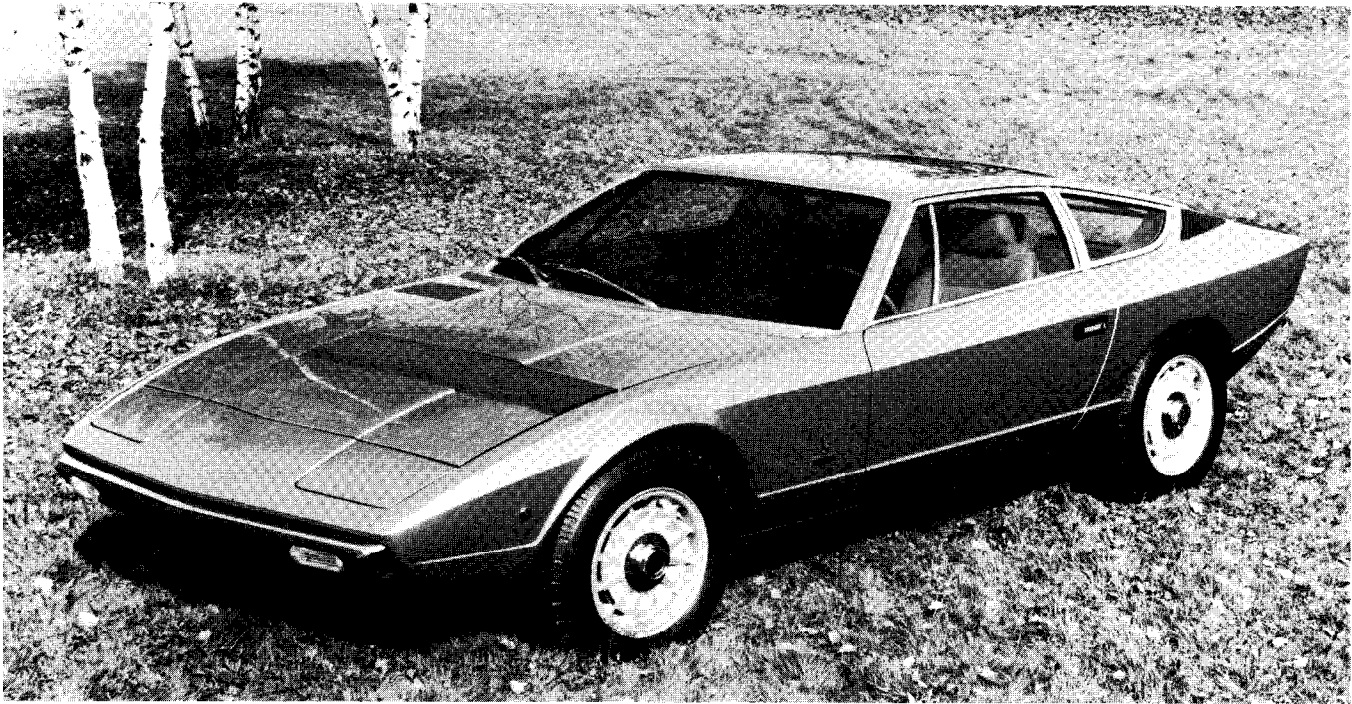


sequent jogging of the driver's right foot on the pressure-sensitive pedal could lead to uneven braking. It also made the heel-and-toe pedal operation beloved of sports-car drivers tricky in the extreme.

This snag notwithstanding, Maserati used the SM brakes *and* steering in the front-engined GT car, the Khamsin. There was a tendency, perhaps because the Bora was strictly a two-seater, to regard it as quite small, and the Khamsin as much bigger. The figures tell another story: the Khamsin was only a few inches longer than the Bora, its wheelbase was actually shorter, and it was lighter. Its front-engine, rear-drive layout gave more space inside and for luggage than the mid-engined car, but the truth was that the Khamsin was aimed at a different and higher market, in fact much more the market for which the SM itself had been intended. In the circumstances the use of SM systems was logical, and the VariPower steering in particular suited the Khamsin extremely well. In the *Autocar* road test of the Khamsin (17 May,

What have we here? Not the SM—Citroën influence on the design of the Merak did not stop short of wishing the single-spoke steering wheel, the minor stalk controls and those less than desirable instruments on the Italian company

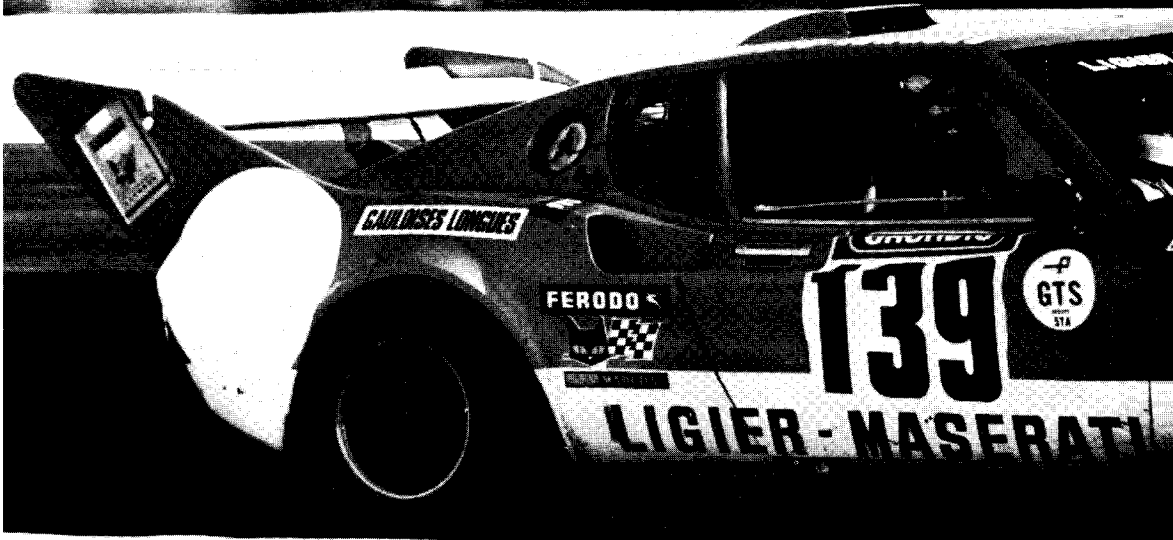




1975) I made the point that the comparative lack of roll compared with the SM made the Maserati easier to drive, especially along a constantly winding road. If the Khamsin was the most successful application of the SM steering system, the same could not be said of the brakes, which suffered from the same drawbacks as those of the Merak—only worse, because they had been made lighter still so that a 30 lb pedal pressure sufficed for a crash stop. At least the handbrake was far better than the almost non-effective device in the Merak. . . .

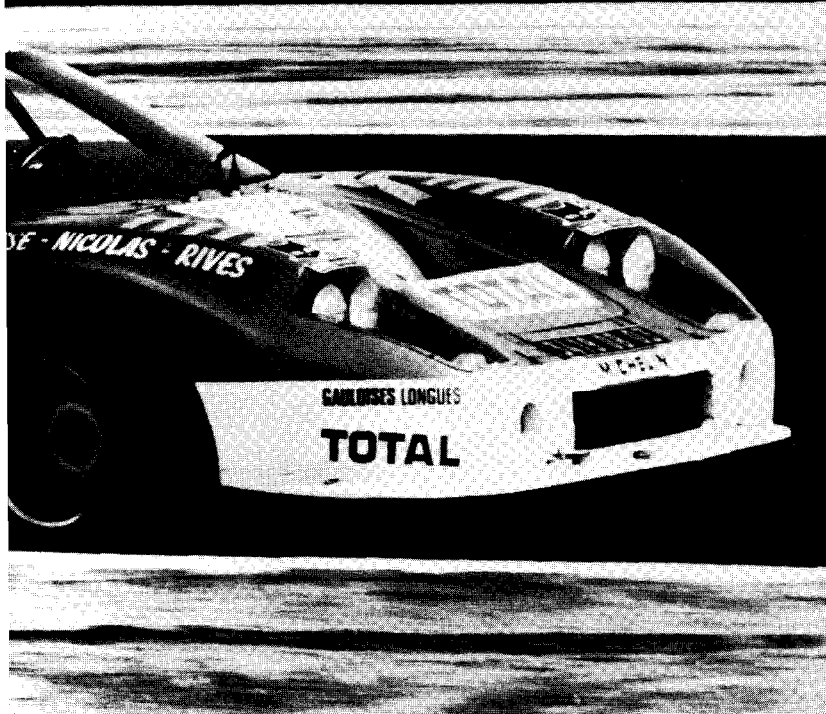
While the Merak and the Khamsin entered production with the SM-derived components, the most impressive Citroën-inspired Maserati project did not. This was the Quattroporte II, shown as a handsome prototype at the 1974 shows and

The Khamsin, a styling tour de force to follow the earlier Ghibli, retained a conventional rear-drive transmission layout but used Citroën systems not only for its braking but also (and with notable success) for its steering



SOWING THE SEED

Guy Ligier campaigned his JS2 with some success in events such as the Tour de France and the Le Mans 24 Hours. The 'Ligier-Maserati' emblem on this car reflects the fact that Ligier undertook series production of the SM on the basis of a tie-up with Maserati, rather than directly with Citroën—but it was Citroën's Paris Press Office which chronicled progress



SOWING THE SEED

Under the Bertone styling of its comparatively staid four-door skin, Maserati's Quattroporte II used SM running gear almost complete. Would this have been a formula to take those technical masterpieces more widely acceptable? Sadly, the Quattroporte came to naught in the wake of the energy crisis and Citroën's enforced abandonment of the Italian company

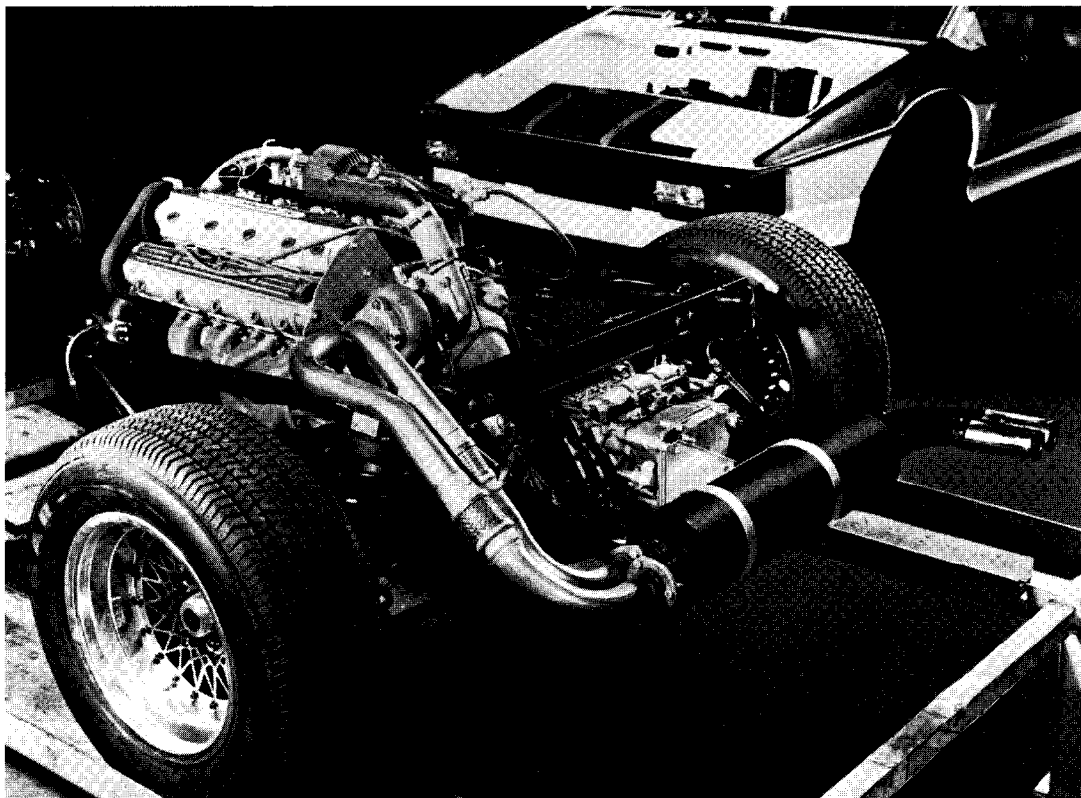


not only SM powered, steered and braked, but suspended as well. Had the partnership survived, the big four-door saloon might have done well, for it would surely have been (by the standards of its class) relatively economical. It was not to be. A week after *Autocar* published its Khamsin test, Citroën announced that they were pulling out of the Maserati partnership, leaving the Italian factory to its own devices and a precarious future—the more so because, according to Citroën's figures, the Maserati operation had lost £2½ million in 1974.

Maserati were not alone in regretting the end of the SM, if not actually rueing their link with Citroën. At Abrest, Guy Ligier found his contract to assemble the car terminated after little more



than a year of operation. In a sense, it did not matter quite so much to him, because he had another iron in his fire—his own specialized, but in its way successful, SM-powered JS2. The JS chassis had been designed at the end of the 1960s by Michel Tetu, and was originally powered by a Ford FVA engine. This was replaced in 1971 by the SM engine, first the 2.7-litre and eventually the 3-litre, to make the JS2. The car was developed for both road and track use: Well over 100 road cars were built, while the racing successes of the JS2 at Le Mans and in the Tour de France were covered by Citroën's own PR organization. Ligier, however, was happy to confine his interest to the engine and transmission, and the rest of his GRP-bodied car was conventional enough.



Above Not the engine, but still the SM gearbox, the most widely-used and long-lived of all the units developed for the car. Lotus have used the five-speed SM box throughout the production life of the mid-engined Esprit, the car shown here being a recent production 2.2-litre Turbo

Just as the Maseratis eventually survived the Citroën withdrawal—and even as I write, you can still buy the SM-engined Merak new—so the Ligier operation continued. The JS2, however, is no longer produced. Ligier has changed direction to become one of the front-runners of Formula 1 racing.

There is one odd British postscript to the SM story. If you study the specification of the mid-engined Lotus Esprit, you may be struck by the ratios of its five-speed gearbox: 2.93, 1.94, 1.32, 0.97, 0.76. This is indeed the other surviving application of the SM gearbox, for which a steady volume of units has been shipped to Britain.

Chapter 7

Postscript: Citroën without the SM

To lose the SM was something of a traumatic experience for Citroën. It was the only production car they lost as a result of the Peugeot takeover, but it was more than that: it had been their flagship, and to the engineers it had been the ultimate expression of their craft. True, its sales had been disappointing even before the energy crisis, and disastrous afterwards, and the situ-



More recent group exploits have concentrated on the limited-production Peugeot 504 Coupé powered by the 'Douvrin' V6 engine—likewise all-alloy, likewise a 90 degree unit, but with far less potential. How might the SM have fared if things had been different?



ation had been made worse by the ill-advised foray into the American market. The last-ditch attempt to preserve the car by taking advantage of Ligier's lower overheads was almost foredoomed.

The engineering essence of the SM was in any case contained in the CX—all, that is, except the magnificence of the Maserati engine. If the SM had done anything, it was to show that the



Citroën, vintage 1980: the mantle of the SM has descended on the CX GTi, far more rational and almost as aerodynamic, and certainly far more economical. Wishful thinking has almost continuously predicted a 2.7-litre V6 version of the CX, but while prototypes have been run, Citroën remain far from convinced. They have even shown that a bored-out 2.7-litre 'four' is as quick . . . but not for production, sadly

VariPower steering was a practical proposition and reliable in service. The gap it left was in part filled by versions of the CX: the GTi for the sporting driver, the Prestige as the company (and indeed national) flagship. The difference is that the CX makes money, while the SM never did, save perhaps for a few months in 1971.

There is no more talk of a powerful and sophisticated Citroën GT car. The nearest to it



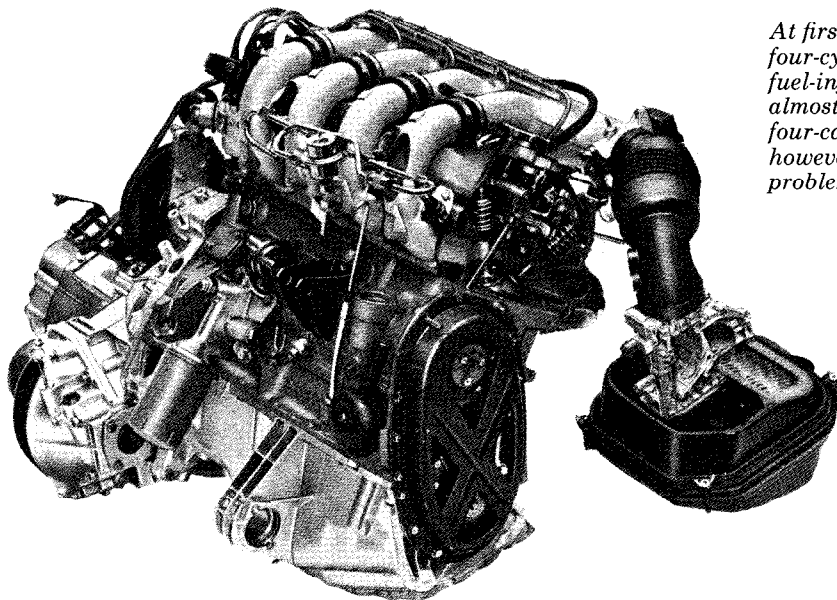
Family resemblance between CX and SM is unmistakable even though the later car solves the space and nose-length problem by placing its engine transversely, ahead of the driveline in typically modern fashion. Single wiper might well have appealed to the SM design team if the thought had occurred to them in time

has been the constant murmur of the simpler, less powerful Peugeot–Renault–Volvo 2.7-litre V6 being tried under the CX bonnet. It is yet another nice idea for the paper pundits. When it did not happen, it was said that Renault, for 50 years Citroën's arch-rival, had vetoed the idea. Yet the 2-litre ohc 'Douvrin' engine, used first in the Renault 20TS, wasted no time finding its way into the CX Reflex and Athena.

The truth is that the Douvrin V6 does not strike all Citroën engineers as suitable. It offers perhaps an extra 10 bhp compared with the present 2.4-litre CX injection power unit; but the whole CX transmission would have to be reworked to

enable it to be installed. In any case, it tends to be a thirsty engine, and the SM left Citroën with a distaste for profligate power units. Any further search for distinguished performance will be accompanied by a concern that it is achieved with economy, and that means that if there is ever a successor to the SM in marketing terms, it will be a very different car. In keeping with their traditions, the Citroën engineers are examining advanced concepts. Turbocharging, certainly; new materials, new methods of construction and the use of electronics to make even the CX systems seem obsolete: all these things are being studied behind the high walls of that most secretive of research establishments at Velizy.

I would not care to speculate what a latter-day SM might look like, or even if there will be one. It is best to regard the SM as a chapter of motoring history in its own right.



At first glance, the CX GTi four-cylinder engine (again fuel-injected by Bosch) seems almost as complicated as the four-cam V6. In practice however it presents fewer problems by far

Specifications

Citroën SM Engine

Six cylinders in 90° Vee, 87 × 75 mm, 2670 cc (3.43 × 2.95 in., 162.9 cu in.). Aluminium alloy crankcase with cast-iron dry liners. Forged steel crankshaft with 120° spaced throws. Four main bearings 76.2 mm (3.00 in.) diameter, crankpins 57.15 mm (2.25 in.) diameter. Crankshaft overall length 402 mm (15.83 in.). Steel connecting rods, 144 mm (5.67 in.) between centres, with slipper-type aluminium-alloy pistons. Compression ratio 9:1. Aluminium cylinder heads with cast-iron valve seats and guides. Duplex chain drive to two direct-acting camshafts per cylinder head, two opposed valves per cylinder with included angle 76°, intermediate jackshaft hollow cast-iron carried in three plain bearings, camshafts carried in three plain bearings. Three Weber 42 DCNF2 carburettors carried on light-alloy inlet manifold, with manual choke control. Fuel tank capacity 19.8 Imp. gallons (23.73 US gallons, 90 litres).

Hydraulic system

Shaft-driven 7-plunger swashplate pump with nitrogen-inflated accumulator, operating at 2000 psi (130 bars nominal) for suspension, brakes and steering.

Transmission

Five-speed all-synchromesh manual gearbox, internal ratios 0.757, 0.970, 1.321, 1.941, 2.923. Output shaft to spiral bevel final drive, ratio 35/8 (4.375:1). Front wheel drive by double-jointed shafts, inner joints pot-type, outer joints constant-velocity (double Hooke joint with ball centre).

Chassis

Combined steel body and chassis with aluminium bonnet. Independent front suspension by twin transverse arms with trailing mountings, lever-operated hydropneumatic spring-damper units interconnected with rear. Fully powered VariPower steering system giving two turns of steering wheel between locks, artificial feel system loaded according to front wheel angle and car speed. Independent rear suspension by trailing arms with lever-operated hydropneumatic spring-damper units interconnected with front. Sus-

pension self-levelling and adjustable for height (driver selection). Disc brakes, front inboard, 300 mm (11.81 in.), rear outboard, 256 mm (10.01 in.) diameter, fully powered operation. Pressed steel wheels, five-stud fixing, 6J rims, 195/70VR15 Michelin XWX tyres.

Dimensions

Wheelbase 116.1 in. (2950 mm), track (front) 60.1 in. (1526 mm), (rear) 52.2 in. (1326 mm), overall length 192.6 in. (4893 mm), width 72.3 in. (1836 mm), height 52.1 in. (1324 mm) at 'normal' suspension setting, weight empty 3197 lb (1450 kg).

**Other developments
December 1971**

Optional carbon-fibre-reinforced wheels, weight 4.66 kg (10.28 lb) per wheel compared with 10.37 kg (22.87 lb) for standard wheel with trim

July 1972

Bosch fuel injection standard. Engine dimensions and compression ratio unchanged. Power output 178 bhp (DIN) at 5500 rpm. Tyre size increased to 205/70VR15

July 1973

Supplementary version with automatic transmission and larger engine. Engine bore and stroke 91.6 × 75 mm, 2965 cc (3.61 × 2.95 in. 181 cu in.), three Weber 42 DCNF26 carburetors, power output 180 bhp at 5750 rpm. Transmission by Verto-Ferodo torque converter-coupling, maximum multiplication ratio 2:1, and three-speed Borg-Warner epicyclic transmission, ratios 0.842, 1.221, 2.012.

Recorded Production

	Citroën Paris	Ligier Abrest
1970	868	—
1971	4988	—
1972	4036	—
1973	2619	—
1974	273	21
1975	1	114

Total production: 12,920 cars

**Recorded Sales—
Europe**

Andorra	9
Austria	67
Belgium/Luxembourg	338
Denmark	2

SPECIFICATIONS

	Finland	2
	France	5509
	Germany (W)	971
	Gibraltar	1
	Great Britain	327
	Greece	8
	Iceland	2
	Ireland	2070
	Italy	1
	Malta	97
	Netherlands	4
	Norway	34
	Portugal	83
	Spain	24
	Sweden	220
	Switzerland	1
	Turkey	1
	Yugoslavia	52
	Others	
	Total	9771
Recorded Sales—	Argentina	4
North and South	Bolivia	1
America	Brazil	11
	Canada	396
	Chile	1
	Colombia	2
	Cuba	2
	Ecuador	1
	French Guiana	1
	Guadeloupe	3
	Guatemala	3
	Jamaica	2
	Martinique	2
	Mexico	16
	Nicaragua	1
	Panama	2
	Paraguay	2
	Surinam	1
	Uruguay	1
	USA	2037
	Venezuela	1
	Total	2490

SPECIFICATIONS

Recorded sales— Africa	Algeria	7
	Angola	19
	Cameroon	15
	Chad	4
	Congo Republic	7
	Dahomey	4
	Ethiopia	1
	French Territory of the Affars & Issas	1
	Gabon	13
	Ghana	1
	Ivory Coast	22
	Kenya	2
	Liberia	1
	Libya	9
	Malagasy Rep.	11
	Mali	2
	Mauritania	1
	Mauritius	1
	Morocco	19
	Mozambique	3
	Niger	2
	Nigeria	11
	Réunion	6
	Senegal	6
	South Africa	10
	Spanish North Africa	43
	Togo	2
	Tunisia	1
	Uganda	1
	Upper Volta	1
Zaire	6	
Other	11	
	<hr/>	
	Total	241
Recorded sales— Asia	Bahrain	1
	Cyprus	1
	Iran	11
	Iraq	1
	Japan	134
	Kuwait	6
	Laos	1
	Lebanon	17

SPECIFICATIONS

Malaysia	3
Pakistan	1
Philippines	1
Saudi Arabia	12
South Arabian Federation	1
Thailand	5
	<hr/>
Total	185

Recorded Sales — Oceania

Australia	5
French Polynesia	2
New Caledonia	24
New Hebrides	1
New Zealand	3
	<hr/>
Total	35

Acknowledgements

I could not have written this book without the background provided by my years as road tester and later Technical Editor at *Autocar*, and a spell as Citroën's UK Press Officer. My thanks are due to all the people who helped me then, and more specifically in refreshing my memory and digging out new facts.

To the publishers of *Autocar*, and especially to its Editor, Ray Hutton, I am grateful for permission to quote passages and figures from road tests and other articles where they have been relevant—together with figures from the rival *Motor* road tests, now presided over by my old friend and fellow-Technical Editor Tony Curtis.

Chez Citroën, my thanks are due to the guiding hand of Jacques Wolgensinger, the technical expertise of Jean-Claude Cardinal, the immaculate information system of Gerard Lorieux and the statistical wizardry (witchery?) of Michelle Boivin, together with Jacqueline Malard and her staff in the photographic department. It would have been a poor book without their contribution.

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