PRESS INFORMATION

CITROËN

EMBARGO TO:- IMMEDIATE 13th OCTOBER 1970

THE CITROEN "SM"

The Citroen "SM" 2-door 4 seater coupe, which Citroen are presenting to the U.K. public for the first time at the London Motor Show, brings together in absolute harmony a broad range of solutions to most of today's problems in perfecting a motor car. Solutions which have created a new concept and a decisive step forward in automotive engineering : front wheel drive, aerodynamic bodywork, hydropneumatic suspension and constant ride height, power disc brakes on all four wheels with two independent circuits and braking effort distribution according to vehicle load, power steering with power centering, both variable according to vehicle speed, a six headlight system all self-levelling through a hydraulic control, Maserati power unit, over square V.6, a 5-speed Citroen gearbox, outstanding road-holding, and a complete and luxurious interior. The combination of all these elements make the Citroen "SM" as advanced a concept in true "Grand Touring" as the DS 19 was in the world of saloon car design in 1955.

The DS was created as a solution to two completely contradictory requirements at that time : roadholding and comfort. In the same way, the Citroen "SM" succeeds in being a synthesis of, until now, incompatible qualities; driving security unknown in this class of car and superb comfort, both related entirely to the high performance capabilities of a sports car.

It can be said that the "SM" represents as marked a contrast between not only the DS and other cars of the "Grand Touring" class, but also as between the "Caravelle" and the "Concorde".

Citroën Cars Ltd., Trading Estate, Slough, Bucks. Telephone Slough 23811 Telegrams Citroworks, Slough, Telex 847053 (Citroen Slough)

The perfection of its aerodynamic design, the inherent safety and comfort of its hydropneumatic suspension, its power steering with power centering, and the pure balance of its body design provide exceptionally active safety qualities. Its complete and carefully engineered equipment, its total comfort for all conditions at all speeds have been integrated into an entity which is rare in cars capable of high performance such as "SM".

The Citroen "SM" is neither a sports car nor a luxury limousine, nor a prototype for proving a new concept of driving security for tomorrow. But it does combine all three of these concepts into one complete entity. "SM" gives to its future owners the highest level of safety comfort and performance, to the ultimate in driver satisfaction.

THE SHAPE OF "SM"

"SM's" bodywork is aerodynamic. It has been designed in a wind tunnel and has literally been sculpted by airflow. Its profile of glass and steel has been freed of sharp edges and flat and angled surfaces which are important contributory factors of resistance to forward movement.

There is no grille, but aerodynamic coachwork below the bumper line provides special ducting for air to the engine and inboard front disc brakes. The six headlight system and front number plate are enclosed by a glass cowling which runs the full width of the car and blends perfectly into the frontal profile. The side glasses are curved and flow into the rounded waist of the body, providing greater relief from the effects of side winds. The bonded windscreen is flush-fitting to avoid the use of a rubber inset surround which would normally create turbulence at high speed. Even the profile of the door mirror has been designed to complement the aerodynamic efficiency of the body shape.

Conceived by the styling department of Citroen's research division from functional data, the shape of "SM" makes no concession to fashion. Its aesthetics have been rationalised and are the direct result of study of logic and reason. With its pure shapes, its flowing profile, its bodyline developed to take account, not only of air penetration and frontal area but also of the dynamic forces acting on it, its tapering shape 8" narrower at the back than at the front, the "SM" is even better aerodynamically than the DS which is already excellent. (The aerodynamic efficiency factor of the "SM" is 25% better than that of the DS).

INTERIOR DESIGN

The interior of the "SM" has been studied for two principle requirements : safety and comfort.

The safety design built into the "SM" is covered by both active and passive requirements. The car is based upon a body construction of varying resistance to force. An extremely rigid chassis section protects all the occupants and a number of body sections at the front and the rear have been scientifically designed to absorb kinetic energy produced by collision. The fuel tank is made from a shock absorbant plastic material and is located between the rear wheels, the steering column consists of a number of articulated sections. Interior safety padding has been specifically located. But true safety design must clearly be preventive or passive. In the case of the "SM", this starts at the driving position which has been designed to eliminate all driver fatigue.

LIGHTING

Night driving with the Citroen "SM" puts into practice new and very spectacular solutions which have been created through joint

development by the Citroen research division and the Cibie company. A front lighting assembly consists of six lights, all quartz iodine, and all having automatic dynamic control. There are two dipped lights, two wide main beam lights and two long-range driving lights which are directionally controlled, pivoting through a vertical axis and related to movements of the steering wheel. This lighting system enables the driver to follow the exact, even sinuous line of the road. The driver thus has a broad, deep and intensely bright light projection at night, one which picks out hazards from a great distance and which enables him to take action in plenty of time and in all road conditions.

The dipped beams have been studied to give no loss in length of visibility when changing from main to dipped beam, yet still comply with the law, (European Code). The lighting power of the dipped beams, both in terms of spread and depth is vastly superior to that provided by normal dipped headlights, due to the use of halogen units (iodine).

All lighting whether on dipped or main beam, remains dynamically stable, irrespective of changes in the vehicle's attitude, due to an automatic self-levelling device. Each lighting group comprises three lights, and the complete assembly pivots around a horizontal axis controlled by a hydraulic circuit which virtually cannot go out of adjustment. This hydraulic control reacts simultaneously with any change in the attitude of the chassis in relation to the ground. It maintains the light beams level irrespective of changes in attitude of the car when accelerating or braking, regardless of ambient temperature and independently of the vehicle's own self-levelling system operating on the suspension. A damper prevents continuous action caused by transient movements, which would only impede night vision by constantly altering the beam angle.

The pivoting action of the long distance driving lights is controlled by the steering pivot through a hydraulic circuit. These lights turn at an angle always slightly in advance of the steering lock angle.

On a very tight corner, the fixed main lights provide lighting spread to illuminate the entrance to the corner, the long distance directionally controlled light on the outside of the curve illuminates the centre of the bend and the long distance light on the inside of the curve illuminates the exit from the bend. When passing a car coming in the opposite direction "SM's" dipped beam light intensity is sufficiently high to prevent its driver having to readjust his vision.

The rear lighting layout complies with the normal regulations and includes reversing lamps.

COMFORT

If the primary task of the engineers in Citroen's research division has been to make the "SM" so safe that its total performance may be used, comfort most certainly has not been ignored. In fact, quite the contrary is the case (which is quite logical since comfort in itself is a highly important factor of preventive safety in eliminating driver fatigue). Whoever sits in the Citroen "SM" immediately notices the atmosphere of quiet luxury and comfort, the tasteful and perfect finish and the practical equipment and fittings (the door pockets located under the front door armrests, for example). On the road, he will certainly appreciate the unusual quietness for a car of this power and performance, the gentle, faultless suspension which swallows ruts and bumps, the fresh air ventilation which works independently of vehicle speed (air volume is varied by a powerful rheostatically controlled fan, and operates independently of vehicle speed because the air entry is so located as to eliminate variations in pressure).

He will notice too, the efficiency of the heating system which has a thermostatic temperature control. "SM's" interior is spacious, even at the rear where the seating has been designed and contoured to give two comfortable seats separated by a central fold-down armrest.

Tinted glass and air conditioning are factory options which complete "SM's" interior specification and which add to its qualities of comfort in all climates.

DRIVING

It is not easy to describe the driving qualities of the Citroen "SM", or the safety and pleasure in driving which it provides.

However, we can work by comparison. The road holding of the "SM" is better than that of the DS. Many thought that it was not possible. It is, nonetheless, true : the stability, in a straight line as well as when cornering, of this new front wheel drive Citroen is astonishing and, without doubt, unique. It is the Technical Division's answer to those who thought that front wheel drive had limitations at relatively high speeds.

The front wheel drive, the extensive development of the suspension and of the axle-geometry, a new concept in steering, the hydro-pneumatic suspension, the low centre of gravity, the high performance tyres, added to the advantages of the aerodynamic body, give the "SM" remarkable roadholding at all speeds on any surface, in any weather, and on any trajectory, which allows the driver to make full use of the capabilities of the car, in the peace of mind ensured by the high safety level.

HYDROPNEUMATIC SUSPENSION

In the suspension system, any change in the ground clearance of the car (variation of load) causes a height corrector valve to

operate automatically, allowing fluid to enter or leave the space between the piston and the gas, so as to correct the ground clearance to $6\frac{1}{4}$" (15.5 cm), whatever the load in the car.

HIGH PERFORMANCE TYRES (VR)

The potential of the car required tyres capable of withstanding extremely high loads and, in particular, they had to live up to the cornering abilities of the car. Furthermore, insistance upon impeccable straight-line stability resulted in a choice of tyres with high directional qualities. The tyres on the "SM" are Michelin tubeless, radial : 195/70 - VR 15 X., fitted on wide rims (6"). Their design is similar to that of competition tyres. Apart from the actual size, they are identical to the tyres of the Ferrari Daytona 375GTB4. They represent the latest step forward in radial tyres (which have established their reputation already as regards safety, endurance, and performance). They are perfectly suited to the acceleration of the "SM" (16.2 seconds for the standing quarter mile) and answer to the high demands made upon them. Their highly developed tread pattern and the quality of their rubber give them remarkable roadholding and adhesion powers, even on wet surfaces.

STEERING WITH POWER-CENTERING

This is the most striking innovation in safety-equipment. To allow the driver to make full use of a car endowed with exceptional roadholding and with a high performance engine, it was essential to provide a steering mechanism which, at high speeds, was capable of responding precisely and rapidly to the finest movements of the steering wheel, but which would, nevertheless, not react to the small involuntary movements which the hands may make.

Study of many considerations showed that the best possible solution was to have a steering as direct as possible and on which the steering wheel effort varied with the speed of the car.

The advantages of direct steering have been demonstrated by many experiments and driving tests. High geared steering provides the greatest ease of manoeuvre on winding roads or in all instances where it is necessary to avoid an obstacle quickly, or whenever it is necessary to make a rapid correction to the trajectory of the car, as a result of the effect of an external force, such as a gust of wind, passing a large vehicle quickly, or the beginning of a skid. For a car, it is an essential element of safety (how many accidents have been caused because drivers were not able to exert the necessary effort at the steering wheel, or because they could not turn the wheels quickly enough due to low-geared steering?). The steering ratio of the "SM" is 9.4:1 (compared with 14.7:1 for the DS). One turn of the steering wheel will take the front wheels from straight-ahead to one lock.

The safety of the steering is considerably increased because the centre of pivoting action of the wheel is on the wheel centre-plane itself. In this way, the combination of forces exerted by an obstacle which the wheel encounters does not induce any parasitic movement of the wheels, nor of the steering, even in the case of tyre trouble.

Furthermore, the steering of the "SM" has a powered self-centering control : the degree of powered centering varies with the speed of the car. With the car standing still, the power assistance is complete, to such a point that the front wheels return themselves to the straight-ahead position when the steering wheel is released. The steering wheel effort necessary to move the wheels increases with the speed of the vehicle and with the steering-lock angle, the increase being greater when the wheels start to leave the straight-ahead position, and decreasing towards the end of the lock. At high speeds, the steering, which then becomes firmer, holds the car on the required trajectory with perfect precision.

This result is obtained by the use of a Centrifugal Steering Regulator driven from the front end of the gearbox. Its speed of rotation is related directly to the speed of the car. Bob-weights inside this centrifugal device exert leverage on a hydraulic slide valve which regulates the pressure inside the power steering circuit in such a way that the force which is required at the steering wheel varies according to the speed at which the car is travelling. Driver effort is minimal when the car is at standstill, yet increases proportionately with the rise in vehicle speed.

The steering with power-centering on the Citroen "SM" is an extremely effective safety device in all circumstances and at all speeds. It ensures for the vehicle a stability in straight-line driving or when cornering, unknown until now. It makes the car easy to handle as well as increasing the pleasure of driving, as much on the open road as in town traffic.

The advantages of Citroen steering with power-centering can be summarised as follows :-

- Extremely efficient power steering, which eliminates all effort when parking.
- Constantly operating power-centering device which is effective even with the car stationary, ensuring remarkable stability, even under side-wind effects, on wet surfaces, snow or black ice.
- Progressive assistance to the driver steering effort required, in direct relationship to the speed at which the vehicle is travelling.
- Astonishing stability at all speeds. When driving in a straight-line, the power-centering gives the impression that the car is on rails. And this impression increases the faster the car is driven.

- Constant guarantee of security when cornering : no matter what steering lock angle is selected, the road wheels are held and this steering lock angle cannot be affected, either by a difference in braking as between one wheel and the other, or by a tyre-burst, or by a wheel hitting a large object, or going over a loose or slippery surface, or a deep puddle. The irreversibility of the steering prevents feedback of reactions from the front wheels to the steering wheel.

- The driver can react more quickly and more effectively immediately traffic hazards occur.

The steering with powered-centering of the Citroen "SM" is unique; it is a new concept, and is at one and the same time the most highly developed and the safest equipment fitted on any car today. It is at least as big a step forward as the hydropneumatic suspension was when the DS was introduced in 1955. As with all new conceptions, the driver needs a short period of adaptation to a new way of driving (especially in town or when parking), rather as was the case for the braking of the DS, where the brake-control pedal-gear, which can give a rapid rise in pressure, needs a certain degree of familiarity to apply the brakes gently for gradual or minimal deceleration, but which on the other hand offers an increase in safety when compared to a braking system which is necessarily progressive by construction or design.

POWER OPERATED DISC BRAKES

The Citroen "SM" has 4 power operated disc brakes. Independent circuits front and rear are supplied from a power reserve linked to the main pressure system for the front circuit, and from pressure in the rear suspension for the rear circuit. Braking effort is distributed by a twin slide valve control which is governed by the weight in the vehicle. The hand brake is located behind the gear lever, and operates on the front brakes through separate calipers. All these factors enable full use to be made of "SM's"

ENGINE-TRANSMISSION

Such an exceptional new car needed an exceptional new engine. It was therefore quite natural, in view of the agreements which had drawn Maserati and Citroen together at the beginning of 1968, that the idea arose of calling upon the experience and resources of this renowned company at Modena, who are specialists in the manufacture of high-performance engines.

Specially designed for the "SM", and inheriting all the enormous knowledge acquired on all the racing circuits of the world where Maserati have lost count of their victories, this engine is a Vee-six, 2670 cc, oversquare (87 by 75), all-aluminium, compact, 4 overhead camshafts, 3 Weber dual-choke carburettors, and hemispherical combustion chambers. It develops 180 b.h.p. SAE at 6250 r.p.m. (Fiscal rating French : 15 CV). Torque is 171.83 ft/lbs. (23.8 mkg) SAE at 4000 r.p.m.

The 90-degree Vee configuration was chosen to save room (in height and in length). In fact, this engine is remarkably short, $12\frac{1}{4}$" (31 cm), with inlet ducting which is integral in the cylinder-heads. Furthermore, the 90-degree Vee provides a better bore-stroke ratio, and makes it possible to have a very compact crank-shaft. This engine is also extremely light (308 lbs - 140 kg) for a 6 cylinder of its capacity, and is very robust. (The crankshaft can withstand any test : its 4 main bearings are no less than 76.2 mm in diameter. The assembly of the main bearings uses a means only employed on the finest competition engines, being fitted in a single block of light alloy. This is a costly means of doing it, but one which guarantees the greatest rigidity).

Close examination of the "SM" engine brings to light its ingenious conception and the high quality of its manufacture, right down to the smallest details.

For example, the whole engine assembly is of light alloy, the cylinder head screws are tightened into special steel bushes. The right hand and left hand cylinder heads are identical. The shape of the tops of the combustion chambers is very elaborately designed. They are combustion chambers with "directed turbulence"; combustion chamber and piston have a particular shape which increases turbulence, and the diameter of the bore is greater than that of the combustion chamber. The pistons have circular deflectors. The drive for the auxiliaries (alternator, compressor for cars with air-conditioning) is taken directly from the intermediate shaft.

This engine has the lightness, the strength, the power and, to sum up, the perfection of a Modena thoroughbred.

Coupled to a Citroen gearbox with 5 speeds, all synchronised and with ratios remarkably well spaced, easy to handle but with a clean change controlled manually from the floor-mounted lever, the Maserati engine confers an astonishing flexibility to the "SM" (it is possible to drive in 5th from very low speed), a sure contribution to driving pleasure and providing performance worthy of its qualities as a long distance car, and of its high level of safety; standing quarter mile in 16.2 seconds, 0-50 m.p.h. in 6.3 secs., 0-60 m.p.h. in 8.2 secs., and a top speed of 136.8 m.p.h. (220 km/h), for a DIN fuel consumption of no less than 22.6 m.p.g. (12.5 litres/100 km).

Safety, performance, comfort, these were the three imperative aims of the designers of the Citroen "SM", giving absolutely top priority to these requirements. They have been achieved. This car of very great class, born of the highest technical experience of Citroen and Maserati, takes its place with the "Grand Tourisme" cars of the greatest repute, through its exceptional qualities of safety, advanced mechanical conception, its roadholding and

performance, yet rivalling the most luxurious of cars with its extreme comfort in all circumstances, its complete and refined equipment and the elegance of its lines.

It is worthy of the place it occupies, that of the French prestige car, long awaited by many.

FOR FURTHER INFORMATION PLEASE CONTACT
D.A. MARSHALL, CITROEN CARS LTD.