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Citroën's pneumatic marvel - the car you can drive on three wheels - is not that scary an ownership prospect

From the early 1930s at least, Citroën has always demonstrated a disdain for the conventional, introducing design features which seemed to be different just for the sake of being so! Words like 'eccentric', 'peculiar', 'avant garde' often crop up in articles about Citroën - in fact about the only words not used are 'normal' and 'conventional'.

Design origins

Automobiles Citroën was set up in 1919 by André Citroën, an engineer with extensive experience in the fledgling European motor industry. The company's history was covered in our piece on the Traction Avant (August 1996), whose introduction in 1934 really confirmed Citroën's reputation as a great innovator - the Traction was the world's first mass-produced fwd car, with optional automatic transmission planned as an option.

Rushed onto the market, quality prob-

lems with the Traction quickly developed into a major disaster for the company. Sales fell alarmingly and Automobiles Citroën would have become bankrupt had the company not been rescued by one of its major creditors, the Michelin tyre company, at the behest of the French Government.

Despite its somewhat inauspicious introduction, the Traction was eventually 'debugged' and remained in production for more than 20 years.

In 1955, Citroën introduced the first of the D series of cars, the DS19. ('DS' sounds like 'Déesse' in French, hence its 'Goddess' nickname.) It was engineered by Traction designer and fwd pioneer André Lefebvre and styled by Flaminio Bertoni (sic!). By all accounts, the Goddess created a major sensation on its release - understandable when one compares the styling with its contemporary competitors. But the Goddess is more than just an unusual-looking car - the list

of technical innovations is almost as spectacular.

Model development

The DS19 was a hydraulic marvel. Just about everything from the suspension system to the braking system, and from the steering to the gearchange, was hydraulically-powered. In 1957 a simpler version was introduced. This car, known as the ID, featured powered suspension only initially.

The 5m-long Safari estate was introduced in 1959. What made the estate so wonderful was that, no matter how heavy the load, the self-levelling suspension always ensured a perfectly level ride.

Then there was the Chapron-built Decapotable, or convertible to Anglo-Saxons. About 1300 were made 1960-71 and today they are the most desirable - and most expensive - variant.



Pallas versions were the top-of-the-range models with all the refinements that made the Citroën experience so special.

The D Series remained in production continuously until 1975, with several upgrades during the period creating no less than 49 model variants with four engine capacities. Not content to rest on its laurels, the Citroën company continued to break new ground, introducing features such as headlights that swivelled with the steering in 1967 and fuel injection as standard in 1969, the first French car to be so equipped.

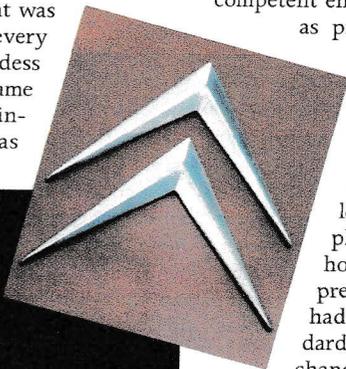
As well as being built in France and England (266 were built in Slough), ID and DS models were assembled at West Heidelberg in Victoria for five years between 1961 and 1966.

A total of almost 1.5 million D Series Citroëns were built between 1955 and 1975.

The DS in Detail

Engine

Strangely for a car that was so revolutionary in every other respect, the Goddess is fitted with the same long-stroke four-cylinder engine that was



used in the Traction Avant - a thirties design with 78mm bore and 100mm stroke, the engine had a cast iron block with wet-sleeve cylinder liners, three-bearing crankshaft and an aluminium head. The engine protrudes slightly into the cabin of the car.

The engine is relatively straightforward and should not be a problem to any competent engine rebuilder - parts such

as pistons, rings and cylinder liners are still available but are a little expensive. Service accessibility is less than perfect - removal of spark plugs requires a tube spanner at least 12in long and the no 4 plug is accessed through a hole in the car's scuttle! In pre-1966 models, the engines had no oil filters fitted as standard, requiring the oil to be changed every 1000 miles or so.

Later models should have the oil changed every 3000 miles.

Transmissions

The gearbox is mounted in front of the engine. Two types of transmission were offered with the first Goddess - a 'hydraulic manual' gearbox, with clutch operated by hydraulic units activated by movement of the gear lever and conventional manual gearbox. Automatic transmission did not become available until 1973, when the DS23 was offered with the reliable old Borg-Warner 35 unit as an option.

Clutch replacement is a big job, but otherwise the manual gearbox doesn't present any special challenges. Potential restorers should be careful if considering an early car with a hydraulically-assisted manual gearbox. So few of these cars are available in this country, however, that the chances of finding one are quite remote.

Suspension, steering, brakes

Perhaps the most important and revolutionary innovation on the car is its unique all-independent hydro-pneumatic suspension system, which provides a

level of comfort not previously seen in any motor car. In simple terms, each wheel of the car is suspended on a chamber of compressed nitrogen, and hydraulic pressure is used to alter the compression of the nitrogen and hence the car's ride height and suspension characteristics. The pressure developed by the hydraulic system is also used to power braking and steering and to help change gears.

The suspension system is controlled by a lever inside the cabin, enabling a choice of five different ride heights, from 6 1/2in to 12in ground clearance, although the driver's manual stresses that the two highest settings are not to be used for normal driving - the second-highest is meant to be used only for slow-speed negotiation of short stretches of difficult terrain (such as rutted roads or snow drifts) and the highest only for jacking the car off the ground, for wheel changing and servicing.

The greatest attribute of the suspension system is that it automatically compensates for the passenger load, ensuring a constant ride height. The system can even compensate for a missing rear wheel! At rest, the car snuggles down on its suspension in a position reminiscent of a clucky hen sitting on her eggs.

Steering is by rack and pinion and the hydraulic braking system is a combination of discs and drums - power discs mounted inboard on the drive shafts at the front, and drums at the rear. In keeping with the car's revolutionary design, the DS was the first production car in the world to be fitted with disc brakes as standard.

The hydraulic system need not necessarily be a worry. The engine-driven hydraulic pump is a very durable unit, although the fluid used in the system up to September 1966, a vegetable oil-based product known as LHS2 or 'red oil', was both corrosive and hydroscopic (ie it absorbed water) so pipes and suspension cylinders suffered corrosion from the inside, which is a little hard to pick! Subsequently a mineral 'green' oil, LHM, was used to prolong the life of the hydraulics system - it is also found in GS



Think Vauxhall Veloxes and Holden FJs, and you might understand the Citroën's impact in 1955

This is a 1960 ID19



Dash panel showing unique single spoked steering wheel, column gear shift.

Instruments in the centre of the dash are non standard extras.

Bob demonstrates the method for attaching road wheels. No conventional wheel nuts for Citroën.

and CX systems. The two fluids are not interchangeable and brake fluid is not an alternative. LHS2 should be changed annually; LHM every 40-50,000km, with the spheres being re-gassed every 2 years.

In use, the car should take no more than 30 seconds to reach ride height, and then you'll hear the hydraulic pump click only occasionally. It's more frequent, the hydraulic spheres may need replacing.

Body and trim

The structure of the Goddess is almost as revolutionary as the rest of the car. The body is made up of a chassis-less monocoque skeleton to which is bolted all external skin panels, including the roof section. Apart from the bonnet which is pressed from aluminium, and the fibreglass roof panel (steel on late cars), all other body panels are made from steel.

The DS models are inclined to suffer from rust in the central body skeleton; the seam between boot and floorpan; in the rectangular box section rails; inside the fuel filler flap; around the windscreen; and in the upper frame section where the fibreglass roof panel attaches to the car. However, the fact that the outer skin panels bolt to the base unit is a big help to the amateur restorer - it is relatively easy to remove all the panels (only four bolts hold on the roof!) to inspect/repair the central structure. This also means, of course, that structural corrosion can be hidden with new exterior panels...

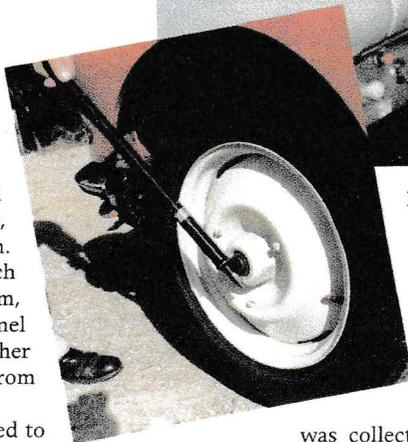
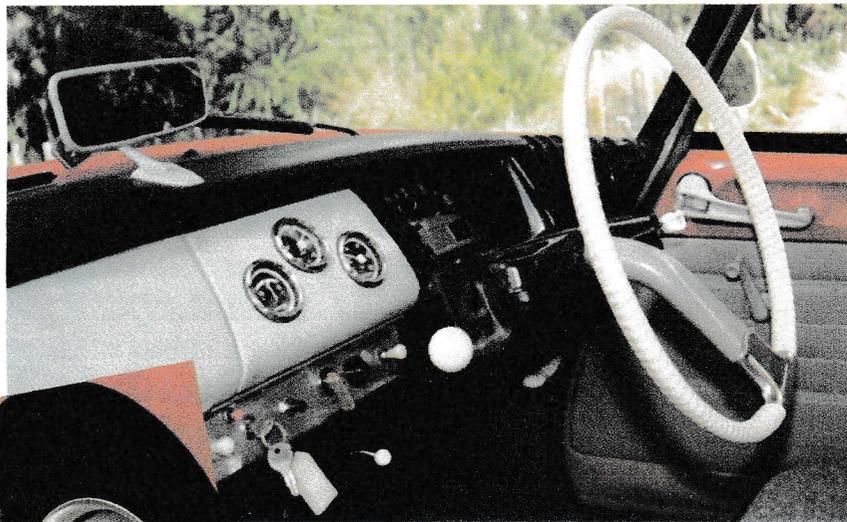
Exterior brightwork is almost all in stainless steel, so corrosion is no problem there. Interior trim is very hard to come by but it has a reputation for durability.

Owner's view

Bob King, of Mount Waverley, Victoria, is the complete Citroën enthusiast - he currently owns seven DS saloons.

One of Bob King's cars is a 1960 model

Part of Bob King's collection. White 1974 D Special features headlamps that turn with the front wheels; blue 1966 ID19 is Australian-assembled and has only 57,000 on the clock



ID19 - which doesn't have power steering and power brakes. Bob's car was built in France as an export model and

was collected in Paris by its first owners, a Kenyan couple, who toured Europe in the car before shipping it home. In the late 1960s, the original owners immigrated to Australia, bringing the Citroën with them. With the odometer reading 57,000 miles, the car blew a head gasket and the owner removed the head to fit a new gasket. Unfortunately he became ill and subsequently died before the engine was reassembled. The car remained headless in a shed in Castlemaine, Victoria, for almost 20 years. The owner's widow eventually contacted Bob to see if he knew anyone who might have been interested in purchasing the car - and Bob did!

After trailering the Citroën home, Bob fitted new sleeves, pistons and rings (cost about \$1000 for the set of four) as the originals had rusted solid. The crankshaft and bearings were checked for wear and refitted when found to

be still in good condition.

One valve which was stuck fast in its guide - so fast, in fact, that the pushrod bent into the shape of an 'S' without budging the valve. The cause was attributed to fuel residue, a gummy treacle-like substance in the fuel tank. A new tank was fitted and there were no further problems.

The Citroën has been back on the road for about five years and has been driven on several long runs, including two to Newcastle. "It's a beautiful car for a long trip," Bob says. "It has lots of room, is very comfortable, will cruise effortlessly all day at the legal limit and still return more than 30mpg."

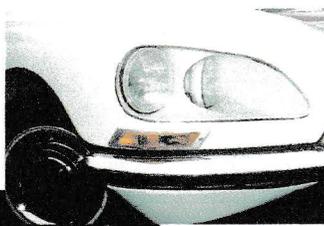
"The DS is an all-round strong, reliable car," says Lance Collins, of DS Motors in Brisbane. "A regular check for suspension-boot leaks and the condition of rubber return hoses is about all that is needed."

Driving

Bob insisted that I take a turn behind the wheel of his beloved ID19. My first experience with the car was a little eerie - when it is parked, the car sits very low to the ground but as soon as the engine is started, the hydraulics are activated and there is a strange feeling as the car rises quietly to its preset ride height.

A distinguishing feature of the Citroën is its huge single-spoked steering wheel, designed as a safety feature with the added advantage that it allows the driver an unhindered view of the instrument panel. "This model does not have power steering so you will find the steering pretty heavy," Bob warned me. He was right, although it lightened up considerably once the vehicle was moving.

The column gearchange is typically Citroën - but the gearshift pattern is



PRODUCTION

Model designation Engine size Year/s

ID19, D19,
D Special 1911cc 1966-75

ID20, D20,
D Super,
D Super 5 1985cc 1968-75

DS19 1911 cc 1966-68
DS20 1985 cc 1968-73
DS21 2175 cc 1966-72
DS23 2347 cc 1972-75

Sedans Safaris Convertibles

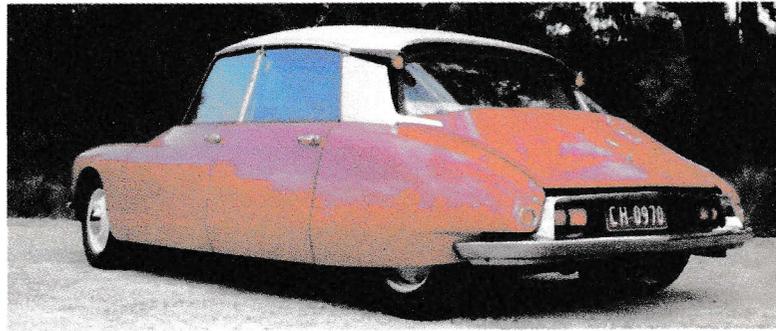
| Year | Sedans | Safaris | Convertibles |
|------|---------------|---------|--------------|
| 1955 | Insignificant | | |
| 1956 | 10,000 | | |
| 1957 | 28,593 | | |
| 1958 | 52,466 | | |
| 1959 | 66,931 | | |
| 1960 | 74,625 | 4,290 | 1 |
| 1961 | 67,837 | 4,880 | 162 |
| 1962 | 73,357 | 5,339 | 209 |
| 1963 | 80,474 | 6,501 | 241 |
| 1964 | 73,293 | 6,223 | 184 |
| 1965 | 76,870 | 6,222 | 127 |
| 1966 | 85,851 | 6,855 | 124 |
| 1967 | 87,482 | 7,211 | 82 |
| 1968 | 68,776 | 6,547 | 95 |
| 1969 | 82,218 | 47 | |
| 1970 | 103,633 | 40 | |
| 1971 | 84,328 | 13 | |
| 1972 | 92,483 | | |
| 1973 | 96,994 | | |
| 1974 | 40,039 | | |

Grand total (all models): 1,330,775

PRICE RANGE

1911cc 1985cc 2175cc 2347cc

| Condition | 1911cc | 1985cc | 2175cc | 2347cc |
|-----------|--------|--------|--------|---------|
| Excellent | \$5000 | \$6000 | \$9000 | \$15000 |
| Good | \$3000 | \$4000 | \$5000 | \$8000 |
| Rough | \$1500 | \$2000 | \$2500 | \$3500 |



unique, almost exactly opposite to usual patterns. However, it was light and direct and I soon became accustomed to the positions of the cogs.

Once on the road, the car was indeed extremely comfortable, especially on bumpy stretches, which are barely noticeable. I usually avoid side streets with those wretched speed humps, but Bob went out of his way to direct me along some of those routes so that I could experience the ease with which the Citroën floats right over the top of the bumps, without slackening speed.

Apparently there are some situations which the Citroën's suspension does not handle all that well. According to a contemporary *Autocar* (UK) road test, "over

bumps of a certain profile, [the Citroën] will react so violently that rear seat passengers will hit their heads on the roof ... a dip in the road will cause the ID to bottom on its suspension stops with equal violence". Another review (*Old Motor*, November 1978) reported "the D's inability to cope with hump back bridges taken at any kind of speed", but our experience was all very smooth sailing.

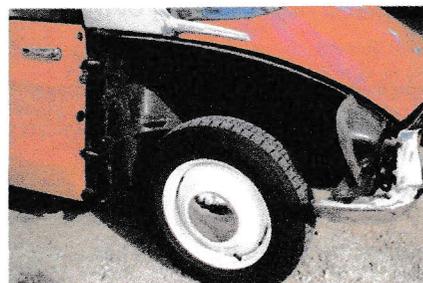
Bob admits that there is a technique for driving a Citroën - the reviews were accurate up to a point, but once the technique is mastered, the car will take anything in its stride.

Probably the only negative thing about driving a DS is the rear visibility.

Unless the car travelling behind you is right on your tail - and I mean within a metre or so - you just won't see it. The side mirrors help but they are useless when reverse parking. This is an acquired art in a DS, as the short boot makes judgement very deceptive indeed.

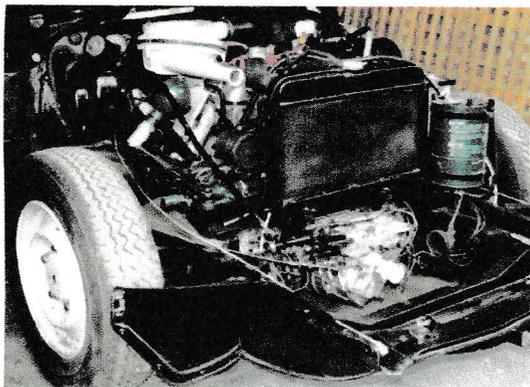
Part of our drive was along a freeway and it was here that Bob's car showed its real strength, loping along at the legal limit without fuss or effort. The car is very high geared, with top (4th) gear virtually an overdrive; Bob pointed out the owner's manual, which states that "the car may be driven freely up to the following speeds: 25mph in 1st gear, 50mph in 2nd gear and 70mph in 3rd gear" with the most economical driving

Ride height set at its lowest and at its highest setting



To change a rear wheel, undo one bolt, lift off the mud-guard and hey presto! Note two pegs at leading edge of rear guard

Take one too many bolts out, and this is what happens... the Citroën's front-end structure



Right, the giant Safari wagon - Ghostbusters, anyone?



speeds being 35mph in 2nd, 50mph in 3rd and 70mph in top.

Final impressions

The Citroën has a whole range of other design features that reviewers of the time either did not notice, or were not inclined to write about. For example, you can change a wheel by using the suspension system to jack the car up. If changing a rear wheel, it is necessary to

first remove the rear mudguard! This sounds ominous but isn't - the guard is held on by one bolt at the rear and slips on to two pegs at the front. Removing it takes only about 20 seconds, which could be a worry if there were a thriving black market for used rear Citroën mudguards.

Rather than the usual studs, the Citroën has only a single hexagonal locking clamp in the wheel centre to lock the wheel to the hub. Bob assures me that

the system is safe, and that he has never heard of a properly installed wheel coming off a car. Citroën bowed to convention from 1968, reverting to five wheel studs.

Thanks to Grant McDuling for his help with this piece.

NEIL WAKEMAN

JONATHAN EMPSON

PHOTOS BY NEIL WAKEMAN



PARTS PRICES

Parts supply is still adequate, with several specialists dealing in Citroën replacement parts and servicing in Australia. There are also active Citroën owners clubs in most capital cities (see the Club Supplement), and many enthusiasts like Bob King out there ready, willing and keen to help with information about this unique and eminently usable classic.

| | | |
|---------------------------------|--------|---------------|
| Front mudguard | \$150 | Second-hand |
| Rear mudguard | \$100 | s/h |
| Door | \$200 | s/h |
| Bonnet | \$700 | s/h |
| Bootlid | \$100 | s/h |
| Windscreen | \$175 | new |
| Pistons, rings, cylinder liners | \$1000 | set new |
| Hydraulic pump | \$280 | reconditioned |
| Suspension spheres | \$35 | each recon |
| Power steering rack | \$500 | recon |
| Engine mounts | \$75 | recon |
| Brake pads | \$100 | set |
| Rear brake linings | \$40 | |
| Brake disc | \$75 | new |

SPECIFICATIONS

| | DS19 (1956) | DS20 (1969) | DS21 (1966) | DS23 EFI (1972) |
|---------------|---------------------------------------|--------------------------------|---------------------------|--------------------------------------|
| Engine | 1911cc ohv four | 1985cc ohv four | 2175cc ohv four | 2347cc ohv four |
| Bore x stroke | 78x100mm | 86x85.5mm | 90x85.5mm | 93.5x85.5mm |
| Compression | 7.5:1 | 8.75:1 | 8.75:1 | 8.75:1 |
| Bhp @ rpm | 75 @ 4500 | 103 | 106 @ 5500 | 141 |
| Torque @ rpm | 101lb ft @ 3000 - | | 128lb ft @ 3000 - | |
| Fuel system | Solex | Solex (early) Weber (later) | Weber Injec option | Fuel injection Injec option |
| Transmission | 4-sp man 4-sp hydr | 4-sp man 4-sp hydr | 4/5-sp man 4-sp manual | 4/5 sp man 4-sp hydr 3-sp auto |
| Suspension | Hydropneumatic on all models | | | |
| Brakes | Inboard discs on front, drums at rear | | | |
| L x W x H | 4800mm x 1800mm x 1500mm approx | | | |
| Weight | 1235-1345kg | | | |
| Top speed | 140kph | - | 160kph | 190kph |
| 0-60mph | 18.6s | - | 14.5s | - |
| Consumption | 24mpg | - | 22mpg | 20mpg |