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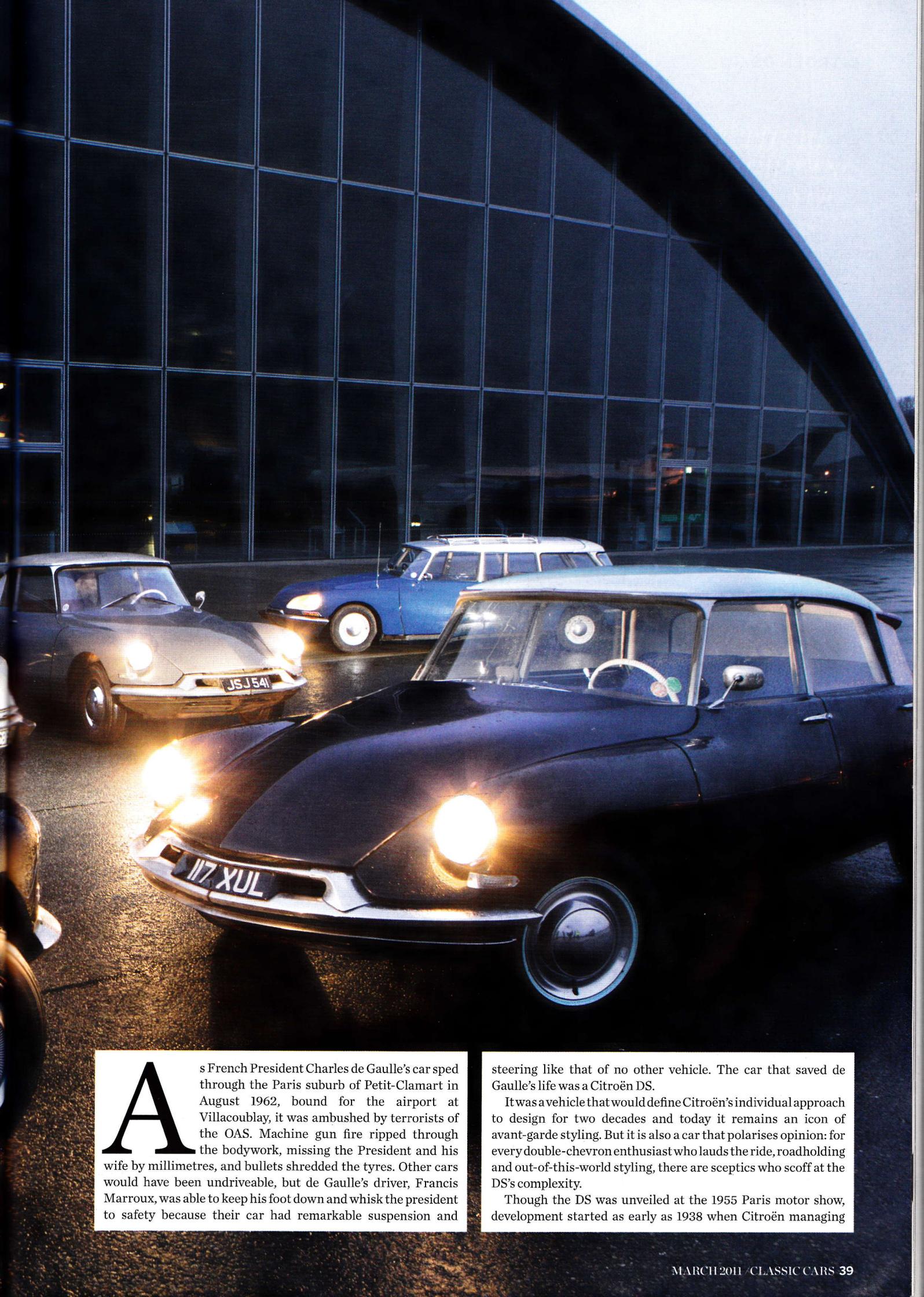
CITROËN DS/ID

# SUSPENSION *of* DISBELIEF

*Hydropneumatic suspension and science-fiction styling make the Citroën DS an icon of individualist design. With prices rising it's time to take a step into the future*

WORDS ANDREW NOAKES PHOTOGRAPHY CHARLIE MAGEE





**A**s French President Charles de Gaulle's car sped through the Paris suburb of Petit-Clamart in August 1962, bound for the airport at Villacoublay, it was ambushed by terrorists of the OAS. Machine gun fire ripped through the bodywork, missing the President and his wife by millimetres, and bullets shredded the tyres. Other cars would have been undriveable, but de Gaulle's driver, Francis Marroux, was able to keep his foot down and whisk the president to safety because their car had remarkable suspension and

steering like that of no other vehicle. The car that saved de Gaulle's life was a Citroën DS.

It was a vehicle that would define Citroën's individual approach to design for two decades and today it remains an icon of avant-garde styling. But it is also a car that polarises opinion: for every double-chevron enthusiast who lauds the ride, roadholding and out-of-this-world styling, there are sceptics who scoff at the DS's complexity.

Though the DS was unveiled at the 1955 Paris motor show, development started as early as 1938 when Citroën managing

## CITROËN DS/ID

director Pierre Boulanger began to think about a replacement for the Traction Avant. The VGD (*Voiture à Grande Diffusion*, mass-market car) was to be a big saloon capable of travelling at speed and in comfort on France's dilapidated roads, and that called for a suspension system with qualities not yet available on any car. Early work was halted by the war and other projects took priority in the immediate post-war years, so work did not resume in earnest until the late Forties, with Citroën chief designer André Lefebvre keen to make the new car genuinely radical. Tragedy struck when Boulanger was killed in an accident in 1950 but Lefebvre pressed on with what was now known as *Projet D*.

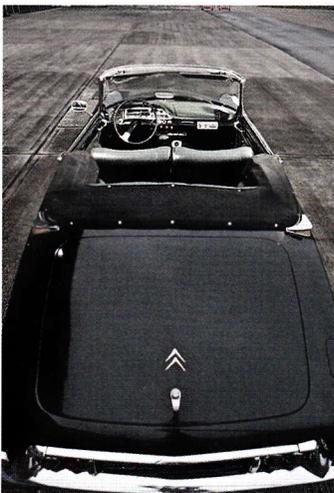
Before the war stylist Flaminio Bertoni had proposed a fastback body style with a smoothed-out Traction Avant nose in the interest of aerodynamic efficiency. With encouragement from Lefebvre he now refined those ideas into a far more forward-looking teardrop shape with low nose and integrated wings. There was no conventional radiator grille, air for the engine being drawn in beneath the car. For a while Bertoni experimented with a hump-backed shape which became known as *l'hippopotame* – the hippopotamus. Later designs reverted to a smoother tail, but their aggressive teardrop form compromised rear headroom. The definitive shape arrived in the early Fifties when Bertoni raised the rear roofline and incorporated a wrap-around rear screen, effectively making the DS a six-light car.

The low nose left little room for the engine, so Citroën engine designer Walter Becchia, who had already drawn up an air-cooled flat-twin for the 2CV, proposed a compact flat-six mounted right at the front of the car with the gearbox behind and driving the front wheels – the same layout as the 2CV. Air- and water-cooled prototypes were built, but experienced problems with over-heating and misfiring, and the extreme forward location of the engine contributed to poor handling. Eventually Lefebvre decided to abandon the new motor in favour of an updated version of the Traction Avant's 1911cc in-line four mounted so far back in the engine bay that it encroached into the front of the cabin. The engine drove forwards to the gearbox – a conventional four-speed manual unit

that was operated in a far from conventional manner. There was no clutch pedal and the driver was provided with a gear selector on top of the steering column with a C-shaped gate, neutral sitting in the middle of the C. Moving the lever away from the driver selected first gear, and a movement to the right selected reverse. From the neutral position, pulling the lever back selected second gear, then moving it right selected third and fourth gears in turn. Pushing the lever left from the neutral position operated the starter. The lever had no mechanical connection to the gearbox, instead controlling a hydraulic unit that automatically disengaged the clutch, operated the gear selectors and re-engaged the clutch.

This automated clutch and gearchange, and also the brakes, were powered by a high-pressure hydraulic system based on work by engineer Paul Magès, but its main function was to provide the required advanced suspension system. In place of conventional steel coil springs or torsion bars were spheres, each divided by a synthetic rubber diaphragm. One side contained pressurised nitrogen, the other had incompressible fluid that transmitted the motion of the road wheel. The result was soft, rising-rate springs providing a supple ride, their connection to the wheels being through a hydraulic system also providing a self-levelling function to cope with changes in load – the usual bug-bear of soft suspension systems. The system also provided the driver with adjustable ride height for use on particularly poor surfaces, and automated jacking for wheel changes. The combination of hydraulic, self-levelling suspension and centre-point steering (where the axis of the steering swivel passes through the centre of the tyre contact patch) gave the car a remarkable ability to cross rough surfaces and drive on flat tyres.

The new car's structure and bodywork was just as innovative as its running gear. The Traction Avant had used a monocoque bodyshell that was unusual for its time and *Projet D* continued the trend by introducing another advanced construction system. A strong platform chassis with deep sills provided most of the structural strength, with the suspension



DS19 Décapotable offers a great combination of style, space and fresh-air motoring. This 1962 example is the real thing – but if you're thinking of buying one make sure it was produced by Paris coachbuilder Henri Chapron



*'FEW OWNERS CARE IF THERE ARE LIMITATIONS TO ITS DRIVING APPEAL - IT'S THE STYLING YOU FALL IN LOVE WITH'*



## THE DS IN MOTORSPORT

**THOUGH THE DS** never had enough power to compete with larger-engined cars on straight-line performance, it was well-suited to long-distance road rallies where reliability, roadholding and comfort – to limit crew fatigue – are more important than speed.

The DS19 won its class on its debut at the 1956 Monte-Carlo Rally, but it took until 1959 for Citroën to sanction a serious works rally effort with the ID19, drivers preferring its unassisted steering and manual gearchange. That year the ID took four outright victories in European rallies, including the Monte-Carlo and Marathon de la Route. In 1961 just eight of the 85 Marathon entries finished, three of them DS19s including the overall

winner driven by Lucien Bianchi. Five DS19s were among 20 finishers in 1962 and four were among the 21 finishers in 1964, Citroën taking home the constructor's cup on both occasions. Citroën's most infamous win came on the 1966 Monte' when Pauli Toivonen's DS21 was awarded victory after Mini Coopers in the top four places were disqualified.

Lucien Bianchi and Jean Claude Ogier nearly won the 1968 London-Sydney Marathon, but were eliminated after an accident. In 1969 Citroën rallied curious two-door DS coupés, Robert Neyret and Jacques Terramorsi winning the Rallye du Maroc in one.

The SM then took over as Citroën's top rally car, though a DS won 1974's UDT World Cup Rally.

loads fed into either end and the engine mounted between a pair of outriggers extending forwards from the front bulkhead. A skeleton bodywork frame, known as a *caisson*, was attached to the platform and carried unstressed body panels, mostly bolted on. The bonnet and boot-lid were aluminium and the roof was glassfibre (though some cars later had alloy roofs). Inside there was even more innovation, with a moulded plastic dashboard and single-spoke steering wheel – Bertoni's proposal for a tiller instead of a wheel didn't make it past the drawing board.

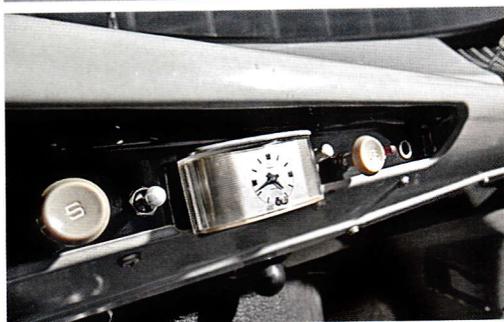
It all added up to an extraordinary machine packed with innovative ideas, and it took the 1955 Paris Salon by storm. The car had been given the name DS19 – a pun on *déesse*, the French word for goddess. Thousands turned out to see the show car, painted in champagne and aubergine (beige and purple) with a sky blue interior and white-wall tyres, as it rotated slowly on a turntable. Many of them thrust handfuls of francs at Citroën salesmen: 1000 orders were taken on the first day, rising to more than 80,000 by the end of the show.

Some potential customers were scared away after the initial excitement had died down. For one thing, Citroën had no cars to sell, as production didn't begin until January 1956, and then only slowly. For another, early cars were beset by hydraulic problems. Some of these were caused by production line workers who lacked experience of building hydraulic systems, and they were exacerbated by dealers who couldn't fix customers' cars.

Despite these early problems, Citroën's rivals had no answer to the DS. Renault's Fregate offered a unitary body and all-independent suspension, but its chrome-laden American styling was rapidly dating. Peugeot's new 403 had Pinin Farina style and promised the same indestructibility as the 203, but it lacked the sophistication of the Citroën. Simca and Panhard simply didn't produce cars in the same class. For Citroën the drawback was cost, as the DS was considerably more expensive than the outgoing Traction Avant or



Citroën DS in its element on the 1972 Monte-Carlo Rally



any potential rival. In Britain it was even more costly at £1726 because of high import duties, and while the motoring press was full of praise for its comfort, cruising ability and economy, journalists had to measure the DS against more sophisticated rivals in the same price range: a DS cost Jaguar money, and that limited its appeal.

At the 1956 Paris show Citroën introduced its solution for customers who saw the DS as too complex and expensive: the ID19 – the letters being a pun on *idée* (idea). Externally similar to the DS, the ID had a simpler interior with a more conventional dashboard, a larger steering wheel and unassisted steering. The brake hydraulics were conventional, and there was a manual clutch and an unassisted four-speed manual gearbox with column change. The engine was the same 1911cc unit, but a revised cylinderhead and intake manifold produced a slightly lower power output. The ID went on sale in the summer of 1957, but there was demand for an even cheaper car, so Citroën produced the ID Normale with a steel bonnet, a bench front seat and no clock, heater, ashtrays or passenger sun visor. Only a few hundred were built before the model was withdrawn in 1960.

By then Citroën had introduced two new models. An estate version, known as the Break in Europe and Safari in the UK, was built on the saloon wheelbase. And at the other end of the practicality spectrum was the Décapotable, a convertible DS built by Paris coachbuilder Henri Chapron. Citroën had planned to build its own convertible, so at first refused to co-operate with Chapron, forcing him to buy complete DSs to convert. But the Décapotable was so impressive that Citroën relented, adding the car to the official DS range and supplying Chapron with part-assembled cars. Décapotables were built in small numbers between 1960-71 and today are the rarest and most sought-after DS models.

The DS and ID both received regular updates: reshaped rear wings were fitted, together with a 12-volt electrical system, for 1960. The DS

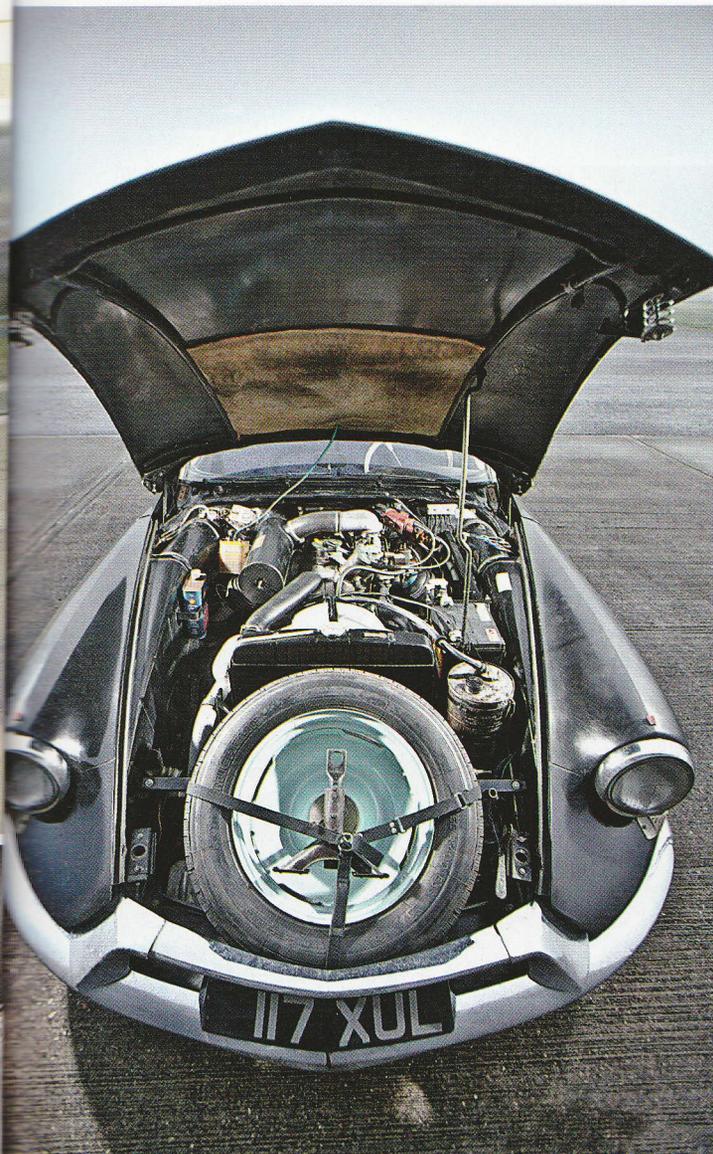
**1957 DS19 has a restored chassis but original paintwork. Self-levelling suspension gives as smooth a ride on rough Fifties pavé as on today's autoroutes**

gained a new dashboard, this time a steel pressing, for the 1961 model year, and in 1962 both models were given a reshaped front that improved engine cooling and reduced drag enough to boost the DS's top speed by 8mph. Similar external modifications were made to

DSs and IDs built for the UK market at Citroën's factory in Slough, though these cars also had their own unique features: wooden dashboards were fitted because Citroën thought they would appeal to British drivers, and there were different seats and Lucas electrics. Slough also built its own DW model, effectively a DS with the ID manual transmission. Slough production continued until February 1966, when the factory was turned over to parts and service operations.

By then there were two DS models featuring short-stroke, five-bearing versions of the venerable Traction Avant engine designed by Georges Sainturat. The DS19 now displaced 1985cc and developed 90bhp, while the new DS21 had a 2175cc unit producing 109bhp and also offered the option of a plush Pallas trim level with leather upholstery and extra brightwork inside and out. The ID gained an 84bhp version of the 1985cc engine for 1967. Other changes included a new gearbox, centre-lock instead of five-stud wheels, and improvements to driveshafts and brakes. The hydraulic system switched to a new fluid, LHM, a thin green mineral oil. Unlike the original red LHS it did not absorb water in use, which meant fewer problems with internal corrosion in the hydraulic system, particularly if a car was left unused. In addition, spilt LHM didn't attack paintwork like LHS.

The most significant update to the DS came in September 1967 with the arrival of a restyled front end. Flaminio Bertoni had started the work and it was continued after his death in 1964 by Robert Opron. The restyle sank halogen headlamps and a new pair of long-range driving lamps into the front wings behind glass fairings (except in the US, where the fairings were banned). The headlamps self-levelled, while the



Far left: long-stroke 1911c in-line four was an update of the Traction Avant's engine

Left: wrap-around rear screen virtually made the DS a six-light car and that sweeping roof does give rear passengers adequate headroom

Below: moulded plastic dash sits behind the single-spoke steering wheel used instead of the tiller originally proposed by stylist Flaminio Bertoni



driving lamps were arranged to steer into corners by means of a mechanical link to the steering rack.

Engine upgrades came next, with new 103bhp short-stroke ID20 and DS20 models, soon to be renamed DSpécial and DSuper. There was also more power for the DS21, which now generated 115bhp in carburettor form or gave the option of Bosch fuel injection producing 139bhp and a 115mph top speed. A five-speed manual gearbox was another option, and for 1973 a 2.3-litre DS23 yielded 124bhp on carburettors or 141bhp on fuel injection.

A more conventional three-dial dashboard arrived for the 1970 model year and for 1972 the original push-button exterior door handles made way for rectangular lift-up handles. The DS was finally phased out in 1975 after 20 years in production, during which time it had always been very expensive to build because of its hydraulic systems and unusual construction. While the DS found nearly 1.5 million buyers and made many friends, it never made a profit for Citroën. Its replacement, the CX, carried forward many DS innovations, including the hydropneumatic suspension.

Driving a DS today is an unnerving experience, not because of its unconventional controls but because so much about the model is so impressive even by modern standards. The semi-automatic gearchange, for example, is amazingly effective, offering fingertip gear selection that's swift and positive, its only demerit being sometimes jerky operation at very low speeds that can make manoeuvring a chore. The brakes are powerful but the light, zero-travel, pressure-sensitive button that takes the place of a conventional pedal takes some getting used to. The power-assisted steering is conveniently weighted, certainly more

so than the hefty wheel of the unassisted ID, and all these cars have a surprisingly good steering lock for a front-wheel drive design of half a century ago. The suspension remains a remarkable achievement, making all but the worst road irregularities imperceptible, though the tendency for the front end to dive under braking is alien to drivers of modern cars.

It's a shame that the DS never got the flat-six engine originally intended for it. The long-stroke four in early cars is a noisy and unrefined lump: it pulls heartily in mid-range but sounds strained if you venture anywhere near its unadventurous red line. The later short-stroke engines are smoother and much more powerful, but they still lack the refinement demanded by the rest of the car.

But few owners care if there are limitations in the DS's driving appeal – it's the styling that people fall in love with, and even cars at the bottom end of the price scale

can look deceptively good, which can lead the unwary into a rash purchase they quickly regret. 'It's a brilliant car if you find the right one, but a more difficult car to restore than most,' says Paul Harris of Potters Bar specialist DS Workshop. 'People buy £2000-3000 cars on eBay and expect them to be sorted for £1500 rather than the £15,000 it will take to do it properly.' A full restoration could easily cost £35,000-plus.

It makes sense to buy the best DS you can afford and get any prospective purchase inspected by an expert. Rust is the biggest worry, as it can attack the chassis and *caisson* body frame without the external panels showing any signs of distress. In extreme cases the structural sills can fail, and the suspension arms can pull away from the chassis.

***'FEW CLASSICS ARE SO  
USABLE OR SO SUITABLE TO  
LONG-DISTANCE TOURING  
IN SUCH COMFORT'***

## CITROËN DS/ID

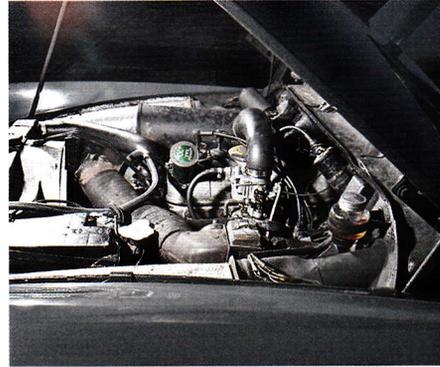
Poor repairs are another common problem. Open the doors and look for rust at the base of the pillars and pull back the windscreen rubber to check for corrosion around the aperture. Rust in these areas indicates the rest of the chassis may be in poor shape. Budget at least £5000 for major chassis repairs.

Corrosion can also attack the body panels. Look for bubbles in the paint at the bottoms of the doors and under the headlamps. A full body restoration is likely to cost around £10,000.

DS interiors are one of the car's strongest features: light, roomy, very comfortable and with masses of Gallic charm, particularly in the earliest cars with their asymmetric plastic dashboards. Wear and sun damage can make cabins look shabby, but they are generally easy to restore. Cloth seat covers are available for around £500, while £1000 buys a complete interior set including door cards. A full leather Pallas interior will cost around £3500.

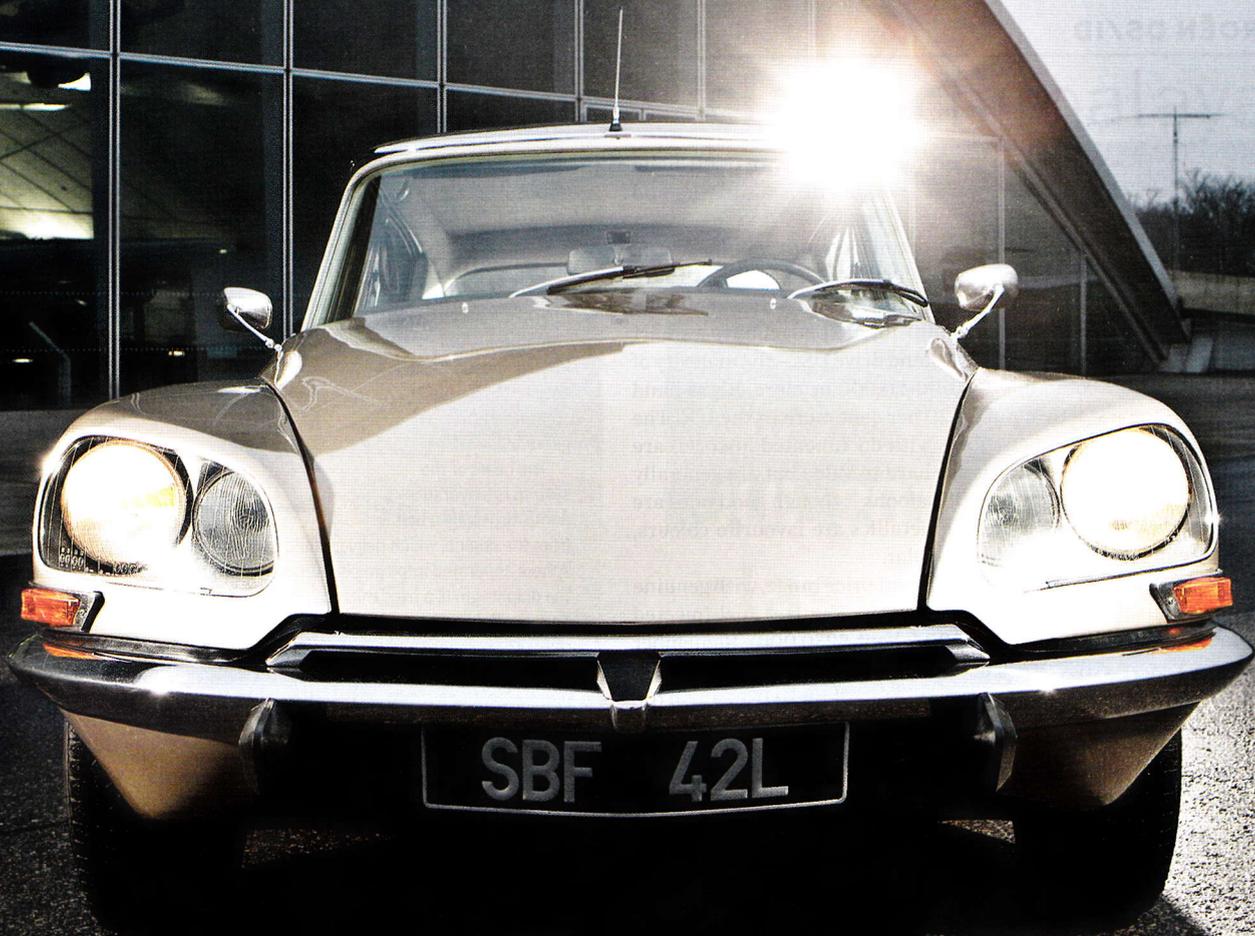
Mechanically these cars are robust. Engines are reliable and good for high mileages before a rebuild (costing about £4500) is necessary, though the cylinderheads on all models are aluminium alloy, making corrosion inhibitor in the coolant essential. Carburettors can be rebuilt for around £200 but fuel injection components are hard to find and tricky to set up, particularly on a car with a semi-automatic transmission. A full overhaul of the system is likely to cost around £2000. An indicator of a well-maintained car is the condition of the drive belts for the water pump, alternator and hydraulics – the belts are cheap but have to be removed and refitted in the correct sequence, a job that's often neglected. Gearboxes often whine (particularly top gear in five-speed units) but rarely fail completely, and can be rebuilt for around £2700.

The hydraulic system is the biggest worry for most new owners, but problems are rarely major. ADS that has been parked with the engine off for some time will have sunk down on to its bump stops, but 30 seconds or so after starting the engine it should rise to its normal ride height; if the car is unladen the lighter rear end should rise first. When the engine



Left and below: 1961 ID19 has an unpainted glassfibre roof and manual transmission. 'Frogeye'-headlight front end is a feature of pre-September 1967 cars



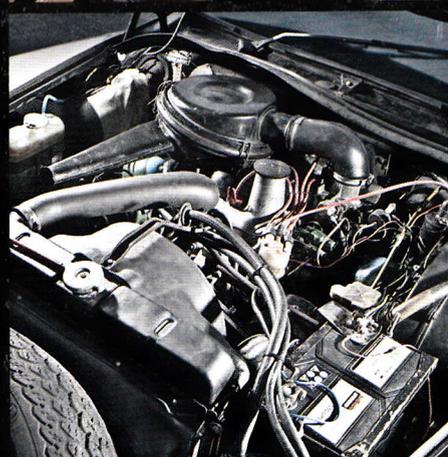


is switched off the car should maintain its height for a few minutes, not sink straight away. While driving you'll hear a variety of clicks and whirrs as the hydraulic system operates; these are normal, but listen for a constant clicking – it may mean the system is having trouble maintaining pressure.

Leaks are the hydraulic system's most common problem and many DSs leave the occasional drip of fluid on the ground. More significant leaks usually indicate worn seals. Catastrophic failure is unusual, but possible: if the pipe joining the hydraulic pump to the pressure regulator fails the system can dump all its fluid in half a minute. If that happens the first sign is often heavy steering, followed by a loss of ride height. By design, the brakes are the last system to be affected. Early cars using LHS fluid can be converted to the more benign LHM, but it means a complete hydraulic system overhaul (£6000) as the two fluids are incompatible. The simpler clutch operation and gearchange on IDs is no more reliable, but faults are likely to be cheaper to fix.

Parts availability varies with age, says DS Workshop's Jamie Piggott, whose company is one of many to manufacture DS parts. 'For post-1970 cars the spares situation is fantastic,' he says. 'As cars get older it gets incrementally more difficult.' Water pumps for the long-stroke 1911cc engine are difficult to find, as are pre-1970 starter motors. Early dashboards are impossible to source and so are the myriad stainless steel trim components fitted to Pallas models – one reason why it makes little sense to buy a non-Pallas and try to upgrade it. 'You cannot economically change one car to another,' says Rad Wojcik of DS Workshop. 'A non-Pallas is going to cost you £5000 to Pallas-ify.'

The choice between Pallas and non-Pallas is one of the most important decisions to make before heading for the classified ads, but there are two others. The first is whether to go for an early (pre-'68) car with 'frog-eye' headlamps or a more popular later car with



1973 DS20 Pallas features a leather interior and more trim inside and out than other DS models. Revised front end – introduced in 1967 and styled by Flaminio Bertoni and Robert Opron – has faired-in self-levelling headlights and driving lights linked to the steering

## CITROËN DS/ID

faired-in lamps. The second is whether you can live with a left-hand drive car, as right-hand drive examples are more difficult to find and often more expensive.

Condition, rather than age, is the main factor in valuing a DS. Driveable IDs and DSups can cost less than £5000, but many will have significant faults. Good IDs fetch up to £10,000, around the same value as a shabby left-hand drive DS. A £10,000-15,000 budget buys a smart left-hand drive DS, while the best right-hand drive DSs – the majority of them in Pallas spec – command £15,000-20,000 or more. Right-hand drive cars tend to be worth about 10-20 per cent more in the UK. The very best restored or low-mileage cars with documented histories are worth upwards of £20,000. Safaris are hard to value but are generally worth slightly less than equivalent DS saloons – though good ones are difficult to find. Black, dark blue and metallics are favourite colours, while beige, white and green are less popular.

The coachbuilt Décapotable is in a different price range, with genuine cars rarely available for less than £100,000. The last fuel-injected Décapotable recently sold for €300,000 (about £250,000). Remember that not every convertible DS is a genuine Chapron Décapotable: the Chapron family maintains the firm's build records and can confirm the identity of a genuine car (see [www.henrichapron.com](http://www.henrichapron.com)).

Buying a good DS or ID demands a degree of planning, knowledge and an expert eye. But if that sounds like a lot to worry about, think of the compensations. Few classics are so usable or so well-suited to long-distance touring in such comfort. Still fewer can boast the DS's automotive design status. And no other car can claim to have saved the life of a president with such style. 🇫🇷

**Thanks to:** owners Marcus Carlton, Mo Mokbel, Denis Cunningham, Noel Gordon and Grahame Baker; Paul Harris, Jamie Piggott and Rad Wojcik at DS Workshop (0203 417 0243, [www.dsworkshop.co.uk](http://www.dsworkshop.co.uk)), Hans Staartjes, Citroën Car Club ([www.citroencarclub.org.uk](http://www.citroencarclub.org.uk)), Imperial War Museum, Duxford (<http://duxford.iwm.org.uk>)

## LIQUID ENGINEERING: THE DS HYDRAULICS

### HIGH-PRESSURE

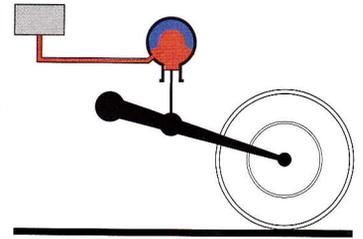
hydraulics are central to the DS concept, providing height-adjustable self-levelling suspension and assistance for the brakes, steering, clutch and gearshift.

The heart of the system is a hydraulic pump, driven by a belt

from the engine, which delivers fluid to a pressure accumulator – a steel sphere separated into two chambers by a rubber diaphragm. On one side of the diaphragm is a fixed mass of nitrogen gas, on the other is hydraulic fluid. As more fluid is pumped into the sphere the diaphragm moves, and the nitrogen is compressed. When fluid is required by the steering, transmission and brake/suspension systems it is supplied by the accumulator, using the pressure of the nitrogen to deliver it.

The suspension uses four more spheres, one for each wheel. A piston forces fluid (shown in red) into the sphere as the wheel rises, compressing the nitrogen (shown in blue) in the sphere, which acts as a rising-rate spring. As fluid enters or leaves the sphere it passes through a system of valves which provides suspension damping. A fluid connection between the suspension units on each side equalises ride height from side to side. If a heavy load makes the suspension droop, or the driver increases ride height with the control lever, a control valve introduces more fluid from the main accumulator to raise the body.

The brakes take fluid from the suspension system, causing a drop in ride height when they are operated. To avoid excessive front-end droop under braking a sixth sphere, the brake accumulator, maintains the fluid level in the front suspension.



### 1955-75 CITROËN DS/ID

**Engine** 1911-2347cc, in-line four-cylinder, Weber/Zenith twin-choke carburettor, Solex single-choke carburettor or Bosch D-Jetronic electronic fuel injection **Power and torque** 62-141bhp @ 4500-5500rpm; 101-135lb ft @ 3000-3500rpm **Transmission** Four-speed manual, five-speed manual or four-speed semi-automatic, front-wheel drive **Steering** Rack-and-pinion **Suspension** Front: independent, leading arms, hydro-pneumatic springs/dampers, anti-roll bar. Rear: independent, trailing arms, hydro-pneumatic springs/dampers, anti-roll bar **Brakes** Inboard discs front, drums rear, powered hydraulic operation **Weight** 1210-1432kg (2668-3157lb) **Performance** Top speed: 83-116mph; 0-60mph: 22-11sec **Fuel consumption** 24-30mpg



Safari – or Break on the Continent – estate was based on the saloon wheelbase. This 1968 car is right-hand drive and has a semi-automatic gearbox – a rare combination. Folding seats in the back make it an early people-carrier, but with a kudos lacked by most of its modern counterparts

