

Frankfurt Motor Show concepts

According to the German Association of the Automotive Industry (VDA), the International Motor Show (IAA) is by far the largest motor trade fair in the world, measured by the number of exhibitors and the area covered, and this year attracted one million people—an event record. Visitors to the 60th IAA held in Frankfurt in September were greeted with 125 world premieres, 60 of which were new vehicles by the world's automotive manufacturers. Prior to the public event, *AEI* editors scoured the show to put together this special section of *Global Vehicles* highlighting the best-in-show concept cars.

Alfa Romeo 8c Competizione

It is always difficult to assess what is the most outstanding car at an international motor show. Should that judgment be based on its novel mechanical applications and solutions? Should it be in recognition of bold use of advanced materials, including carbon fiber, for cars that are exotic, exceedingly costly, and at

McLaren and Vision CLS concept, the **Jaguar** R-D6 concept, **Aston Martin** DB9, and **Audi** Le Mans concept. The Alfa was unveiled to some razzmatazz, but compared to the welter of information released by most companies on their glossy new products, 8c Competizione was in another league. When asked for press information in English the company's representative said: "It is a new car. Just arrived. We have nothing." Unusual in the extreme.

But eventually the information appeared, and the reality was impressive. The two-seat Alfa coupe is mechanically a close relation of the **Maserati** Coupe, using that car's 4.2-L V8 producing "over" 400 hp (298 kW) at 7000 rpm and driving the rear wheels through a six-speed manual gearbox also at the rear to achieve better weight distribution.

Top speed is said to be in excess of 300 km/h (186 mph) with 0-100 km/h (0-62 mph) in 4.5 s. Suspension is double wishbone front and rear. Tires are 245/40 R20 in front, 275/35 R20 rear. Wheelbase is 2595 mm (102.2 in) and overall length 4278 mm (168.4 in). The car is 1250 mm (49.2 in) high—a figure that has become almost *de rigueur* for very powerful sports coupes. With extensive use of carbon fiber, empty mass is about 1500 kg (3310 lb).

All this would be impressive enough, but Alfa Romeo's Centro Style has come up with the sort of purist aesthetics rarely achieved today. The car has very short overhangs that give it the sort of dynamic signature that many designers can only talk of in terms of hyperbole. The car has



Alfa Romeo 8c Competizione

variance with a world of speed limits? Or should it simply be because it looks "right"—that it manifests a hard-to-define, almost esoteric element that singles out its design and engineering as something unexpected and special? If that third criterion is applied, then the **Alfa Romeo** 8c Competizione concept revealed at the Frankfurt Motor Show is indeed outstanding.

Such judgments are totally arbitrary and the competition was fierce at Frankfurt: **Mercedes-Benz's** SLR

some retro aspects but not the sort of *passé* retro that is too often just an old (albeit often well-loved or classic) design resurrected and modernized.

The 8c designation though is certainly retro, harking back to the 1930s and 1940s when it identified the racing and road cars that were equipped with the then new eight-cylinder engine developed by engineer Vittorio Jano, and “Competizione” was used for the 6C 2500 Alfa Romeo coupe driven by Fangio and Zanardi in the 1950 Mille Miglia.

Alfa Romeo is understood to be planning to build 1000 examples of the 8c Competizione, although its name may change for production. And a convertible version is in prospect.

Stuart Birch

Audi Le Mans

It was hardly a surprise that Audi’s mid-engined two-seat concept for the Frankfurt Motor Show should be called Le Mans. The company’s cars have won the Le Mans 24-hour endurance race three times, and it is cashing in on that success. But the Le Mans quattro concept study, as Audi bills it, has been

Audi has previously created impressive concept sports cars, the Avus of 1991 being a fine example, although that car did not make it to production. Audi was being cautious at Frankfurt about the possibility of the Le Mans reaching series production.

The continuing emergence of ultra-high-performance road cars shows no sign of waning despite ever more widespread—and effective—speed restrictions and anti-speeding measures. The Le Mans is a case in point, having a 610-ps (449-kW) 40-valve FSI engine producing 750 N•m (553 lb•ft) between 1750 and 5800 rpm, with a 0-100 km/h (0-62 mph) time of 3.7 s, 0-200 km/h (0-124 mph) in 10.8 s, and a “theoretical” top speed of 345 km/h (214 mph), although the car is electronically governed to a mere 250 km/h (155 mph). Twin water-cooled turbochargers are used with charge air intercoolers mounted above the engine, taking air from a body side inlet. Two oil coolers use air from the side inlets.

fluid for a magnetorheological fluid, the viscosity of which can be varied by applying a magnetic field. Sensor and computer linked, the electromagnetically controlled system has sport and comfort settings selectable by the driver from a steering wheel switch.

The car has 20-in wheels with 255/30 tires at the front and 295/30 at the rear. Brake discs are ceramic with diameters of 380 mm (15.0 in) at the front and 356 mm (14.0 in) in back.

The Le Mans is based on the Audi Space Frame (ASF) structure, while the body’s outer skin and various other components are of mixed weight-saving construction, using aluminum and carbon-fiber-reinforced plastics. The car’s gross mass is 1530 kg (3370 lb), and it has a power-to-mass ratio of 2.5 kg/hp (5.5 lb/hp). Detail technology includes use of a water repellent coating for the windshield.

Audi’s interior designs and finishes are benchmarks for much of the rest of the auto industry, and those of the Le Mans are an object lesson of semi-racecar style and functionality, with the instrument panel angled towards the driver. Audi describes the color of the interior as using “technical shades” to create a visual link with motorsport. The dashboard uses what Audi describes as “a high-grade semi-transparent woven material with a network structure.” This material is also found on the outside of the seat shells. Controls are of rubber and aluminum, and four-point automatic reel seatbelts are fitted.

The Le Mans has been conceived as both a road and a potential track car with a multi-function instrument capability covering analog, track, and multimedia interface modes. When cruising and in the analog mode, the face becomes a digital speedometer with an analog display and a clock display. Those who take the Le Mans quattro out onto the race circuit can use the track mode to display a plan of the circuit. Information obtained by GPS is used to show the next bend and compute lap times. In parallel with this, the almost square central section displays information on the selected suspension settings and the gear in use. The principal data on the engine’s operating condition (oil pressure, temperature, etc.) can be obtained in multimedia mode. For road use, route guidance pictograms supplied

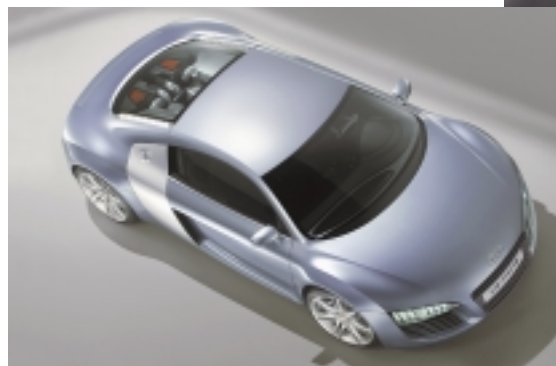


Audi Le Mans quattro

The engine drives through a sequential six-speed gearbox that Audi is at pains to point out has widely spaced ratios rather than the close ratio set of most high-performance cars. The reason, of course, is that massive torque, which is distributed via a Torsen C differential 40:60 to front and rear wheels under regular conditions, but with a spectrum from 20:80 to 70:30 depending on conditions.

Suspension includes double wishbones at the front and rear, upper and lower triangulated at the front, while the rear has a triangulated upper system with the lower in trapezoidal configuration. Steering is speed-sensitive powered rack-and-pinion. The Le Mans’ dampers use Audi Magnetic Ride technology, which sees the substitution of hydraulic

designed as a road car. It borrows from **Lamborghini**’s Gallardo in terms of its structure, although the Audi’s wheelbase is stretched 90 mm (3.5 in) and its engine is an Audi 5.0-L V10 with direct gasoline injection (FSI) technology and twin turbos. The Le Mans has a roomy but highly functional cockpit, which includes a distinctive multifunctional steering wheel with part-flattened rim. The car is wide and low—1.9 and 1.25 m (6.2 and 4.1 ft), respectively—with an overall length of 4.37 m (14.3 ft) on a wheelbase of 2.65 m (8.69 ft). Its body is aluminum.



by the navigation system displays are shown. The system is controlled from a terminal on the center console.

The exterior of the Le Mans includes the use of space-efficient light-emitting-diode (LED) headlights with clear glass covers. The 17 cooled light sources on each side are much closer to the transparent cover than is normally the case, says Audi. Later iterations will have dynamic cornering beams that obviate the need for mechanical headlight turning systems. The rear lights also use LEDs.

Stuart Birch

Volkswagen Concept R

Light, powerful, and high tech was the basic philosophy for the design of Volkswagen's Concept R two-seat mid-engine roadster, and that's how it materialized at the Frankfurt Motor Show. With a 195-kW (261-hp) V6 engine driving the rear wheels through a six-speed DSG (Direct Selection Gearbox), the car points a new direction for VW as it endeavors to counter such opposition as the BMW Z4. The

(32.6 in), rear 744 mm (29.3 in). Tires are 255/40 R19.

While VW gave limited mechanical details, the company put the main emphasis on aesthetics at the car's unveiling. Instrumentation owes something to glass cockpit aircraft design, being based on a multifunctional need-to-know basis, providing up-front information for the main task at the time. Speed is always prominently displayed. Center-console air vents display temperature settings digitally and may be individually adjusted to vary temperature.

The car's two bucket seats are fixed, the driver electrically adjusting the instrument cluster to an ideal position and the passenger moving a footrest. The firmness of the seats' springs can be adjusted. "Active" foam, originally used for space vehicles and now for some office furniture, is fitted to the seats, adapting to body contours. The seats' head restraints move forward by 5 cm (2 in) when occupied for added safety. Like Audi's Le Mans concept, headlights and taillights use LED technology.

Stuart Birch

grille milled from solid aluminum and flanked by large air intakes. The door handles are flush with the body and are activated automatically when the owner approaches. An "Open & Start" transponder, as installed in the new Astra, identifies the owner and replaces the conventional car key. At the touch of a button, the tailgate opens by electric motors to reveal a VDA-measured 410-L (14.5-ft³) trunk. Folding the rear seat yields a level surface with up to 970 L (34.3 ft³) of load-carrying capacity. Building on Opel's Flex7 and FlexSpace seating systems, a section of the center tunnel that separates the two individual rear seats can be moved back under the trunk-floor to reveal a folded seat that



Opel Insignia

Opel Insignia

The Insignia demonstrates the innovative ideas concept developers have come up with for a future "big Opel" featuring numerous technologies including extensive use of light-emitting-diode (LED) lighting, unique pantograph-action doors and tailgate, a versatile interior layout, and a focus on driving dynamics. The concept can be transformed from a four-seater for day-to-day purposes into a five-seat transport vehicle for weekend activities.

Opel's engineers chose as the basis for the Insignia a new General Motors rear-wheel-drive architecture being developed for future global products. Double wishbones and coil springs in front and a five-link axle in back are coupled with hydraulic load-leveling control to compensate for changes in payload. Power comes from the Corvette's 344-hp (257-kW) aluminum V8 engine, which gives it a top speed of 250 km/h (155 mph) and acceleration from 0-100 km/h (0-62 mph) in under 6 s.

The 4803-mm (189.1-in) car has a coupe-style body, short overhangs, and a long 2915-mm (114.8-in) wheelbase. The front end is dominated by a radiator

can be raised electrically to make the Insignia a five-seater. In the tunnel, designers have integrated a DVD player with folding screen, a cool-box large enough for two bottles of champagne, and a cigar humidor.

Up front, the cockpit has "3-D" instruments and control satellites for the most important functions. Secondary controls for such functions as infotainment and air-conditioning are hidden under sliding covers in the center console. The LED-lit instrument dials are positioned in front of the needles so as not to hide the numerals as the needle moves past them. Blue and green LEDs light the interior from concealed slots in the doors and ceiling.

possibility of the Concept R leading to a production version looks possible for MY2006. Although VW gave no figures for the concept, it is understood that low weight was a priority to achieve the sort of power-to-weight ratio that VW regards as essential in this class. The move to rear-wheel drive is also significant, likely to be applauded by the customers to whom the car is pitched.

The engine is a development of the V6 unit used in the Golf and produces 280 N•m (207 lb•ft) of torque at 2800 rpm. Performance includes a 0-100 km/h (0-62 mph) time of 5.3 s and a theoretical top speed of 270 km/h (168 mph) but with a 250-km/h (155-mph) limit. The Concept R is compact, with an overall length of 4.16 m (13.6 ft), width of 1.78 m (5.84 ft), and height of 1.25 m (4.10 ft). Front overhang is 829 mm

The Insignia is a showcase for how light could be generated in future cars. Deflected in various directions by prisms, it comes from more than 400 LEDs in the headlamps, rear lights, fog lights, brake lights, instruments, and the car's interior. The approach opens up entirely new opportunities in car design, says Opel.

A pantograph mounting and lever principle is used so the two large rear doors can be opened in tight confines. Like a sliding door, but without the rails, the doors move parallel to the body rather than swinging outwards. Though pantograph hinges with two pivot points have often been tried in automobiles, Opel says that this is the first time that the door has been successfully realized without multiple levers while maintaining harmonious styling. A total of 45 electric motors are installed on the concept car to not only open and close the doors, but also to move the seats forward automatically to make access to the rear easier.

Kevin Jost

Toyota CS&S

The CS&S (Compact Sports & Specialty) concept roadster from **Toyota** combines the company's latest hybrid technology with innovative packaging and new information technology (IT). What looks at first to be an open two-seater sports car can convert into a 2+2

via removable rear canopies. To boost security, the front seat is designed so that it can be rotated to cover the cockpit area.

Positioned between the current Celica and MR2 models, the mid-engine 2+2 sports car is powered by a 1.5-L gasoline engine driving the rear wheels and an electric motor for the fronts. The combination is said to offer economy, because of the relatively small conventional engine, together with four-wheel drive and strong acceleration thanks to the electric motor's high torque.

The short, wide, and low proportions of the car are accompanied by an extremely low center of gravity, according to Toyota. Body height is 120 mm (4.7 in) lower than the MR2's at 1120 mm (44.1 in) and width is 65 mm (2.4 in) greater than the Celica's at 1800 mm (70.9 in). The wheelbase is long—2550 mm (100.4 in)—for a vehicle length of 3940 mm (155.1 in).

The CS&S hybrid system will go into production in the second-generation Prius. In contrast to "conventional" hybrid systems that rely primarily on a gasoline engine for propulsion, the concept of Toyota's Hybrid Synergy Drive gives the electric motor a more important role when powering the vehicle both for fuel efficiency and peak performance. The electric motor is much more powerful, which means the gasoline engine is used less, translating into better fuel economy and improved performance, says Toyota.

At the heart of the CS&S's new Toyota Space Touch IT concept is an integrated multimedia system operated by a series of holographic projections that the user "touches" to make a selection. Spheres of information appear to float in space, but when touched they allow the user to

control functions such as the air-conditioning, audio, and satellite navigation. The system is said to be simple and intuitive to use, breaking new ground in human-machine interfaces.

Kevin Jost

Ford Visos

The Visos is **Ford's** blend of a sports car and a luxury touring car. It is powered by a six-cylinder bi-turbo engine that delivers 257 kW (345 hp) and 400 N•m (295 lb•ft), mated to a six-speed transmission driving all four wheels. A liquid crystal display (LCD) monitor, mounted to one side of the engine, displays the current setup. By plugging a laptop computer into a USB port next to the LCD monitor, the user can change settings for such attributes as the dampers and rev limiter. Users can even download preset configurations from a Ford server on the Internet, or swap setting files with other owners.

Active Surfacing is a technique that sees the technologies of the vehicle hidden until they are called for by the driver, the road condition, or the vehicle's dynamics. When the driver selects Sport mode it initiates a series of changes to the exterior, interior, and performance characteristics of the car. Externally, this results in the deployment of the front splitter, rear diffuser, and rear spoiler. In Comfort mode, the vehicle does not necessarily require the same aerodynamic assistance and so these devices are retracted into the body. Regardless of the operating mode, the aerodynamic aids are deployed automatically at 90 km/h (56 mph).

The lighting, soft in Comfort mode, turns brighter and more purposeful when Sport is selected, while the seats automatically reshape to hug the occupants. The steering wheel slides closer to the driver, and the angle of the seat adjusts to a more sports car-like position. The instruments switch to Sport mode supplying an array of information to suit a keen driver, and the gear lever is deployed from the center console to operate the sequential transmission. Select Comfort mode and gentle lighting is resumed and the seats are restored to a more comfort-orientated configuration.

Integrated door cameras, sourced from **Magna Donnelly**, fold flush into the door panels when the vehicle has



Toyota CS&S





Ford Visos

been shut down, ensuring that they are fully protected from dirt or damage. When the engine is started, the cameras automatically rotate out of the door surfaces. The camera imaging system provides a clear rear view and features blind-spot detection to warn the driver if it is not safe when changing lanes.

David Alexander

Mazda Kusabi

Translated from Japanese, Kusabi means "wedge," reflecting the design of the upper sections of the car. Originally referred to as the Flattop project because of its flat roof, the Kusabi concept showcases Mazda's efforts to develop innovative access systems and packaging solutions. Powered by a 1.6-L common-rail diesel engine with a six-speed transmission, the concept aims to make everyday city driving more fun by defining the everyday sports sub-compact.



Mazda Kusabi

The Kusabi concept interior integrates the instrument panel with a rigid annular aluminum frame around the footwells. The front seats feature inside-swing seatbacks for easier access to the rear of the 2+2 cabin. The centrally located hinge mechanism is aluminum, as are the removable rear strut tower stiffeners in the luggage area. Aluminum frames running across the bottom of the bulkhead and door trim continue the theme, and have built-in lighting linked to door opening and closing.

The Twin-Lift Hatchback provides two opening modes. Two split-hatch doors open individually on a hinge mounted longitudinally in the center of the hatch. The hatch also opens conventionally for stowage and removal of larger items.

Power comes from a new 1.6-L MZ-CD diesel engine with diesel particulate filter and ultra-high-pressure common-rail fuel injection, developed for sporty performance and a high level of environmental compatibility. High stiffness was designed into the block to contribute to the low target levels of noise, vibration, and harshness. At 4000 rpm this engine delivers 80 kW (108 hp), and the maximum torque of 240 N•m (177 lb•ft) is available at 1750 rpm.

The Kusabi transmission is a six-speed automatic-shift-manual gearbox optimized to allow the driver to get the most out of the engine. The ease of an automatic with the feel of manual-shift driving contributes to the goal of a vehicle that is responsive and fun-to-drive in city traffic.

David Alexander



Peugeot 407 Elixir

Peugeot 407 Elixir

The 407 Elixir is the latest concept car from Peugeot that gives a glimpse into its future trends of styling, architecture, and engineering. The steeply inclined windscreen blends into the glass roof, and the inclined sides of the car adopt the slightly negative camber of the 21-in (530-mm) diameter wheels. At the back are twin exhaust pipes, LED-type rear lights, and an opening rear window accommodated in an upright tailgate. To provide more light, the rear window extends sideways in a reverse-angle slope as far as the pillars of the rear quarter panel.

The 407 Elixir is designed to seat four people in comfort, with features like dual-zone automatic air-conditioning. The doors open to reveal an interior with no partition or rear parcel shelf, housing four identical adjustable seats. Satellite navigation is displayed on a 7-in color screen. The passenger compartment features materials such as light leather, bordered at the top by aluminum inserts that run the length of the interior.

Passive safety features pre-tensioning seatbelts with a seatbelt-not-fastened indicator for each of the four seats.

Passengers are protected by nine airbags, one of which—incorporated in the steering column—protects the driver's knees.

Power for the 407 Elixir is provided by an all-new, 2.7-L, six-cylinder diesel engine that develops 148 kW (198 hp), with a maximum torque of 440 N•m (325 lb•ft). This engine features the latest-generation particulate emission filter, ensuring unlimited automatic regeneration regardless of mileage.

The transmission is a **Porsche** Tiptronic sequential gearbox with a gear lever for choosing either 100% automatic operation or sequential driver control of the gear changes. The car has dual wishbone suspension at the front and a multi-arm system at the rear, combined with a new electronic stability program.

David Alexander

Citroën C-Airlounge

The latest concept vehicle from **Citroën** aims to combine aerodynamic design with modular interior space. Extensive studies on aerodynamics produced multiple airflow control systems that combine to reduce the drag factor to 0.26. The wheel rims are designed to suck the air to the center of the wheel to minimize swirl. Air ducts channel air from the high-

pressure front end to the front wheel arches. Blade vortex generators are installed crosswise at the rear of the roof to produce small swirls of air locally, which has the effect of streamlining the airflow behind the vehicle.

The cantilevered seats can be power-adjusted to make a four- or five-seat vehicle. In four-seat mode, the central rear seat retracts under the floor, freeing more space for the two side seats, which are mounted on rails in a curve. In five-seat mode the two outer seats turn slightly toward the center. During the journey, occupants can change the appearance of their surroundings, choosing from a variety of effects such as candlelight or intense color changes. The effects are produced by using the light and video projectors in the carpet and trim of the armrests.

C-Airlounge is fitted with a 3.0-L V6 engine that develops 152 kW (204 hp) at 6000 rpm. Transmission is an automatic auto-adaptive gearbox controlled by a sequential gear lever or by paddles behind the wheel. The Hydractive 3 suspension offers comfort or sport settings, and automatically adapts vehicle height to speed and road surface condition.

The **Michelin A Eole** run-flat tires were developed as part of the overall design process. Benefits include increased loading capacity, lower sidewalls with no comfort trade-off, and reduced rolling resistance.

David Alexander

Nissan Dunehawk

A family adventure on four wheels, the **Nissan Dunehawk 4x4** concept puts the fun into function, says Nissan. Improving its position further in the European market, Nissan is—among other things—focusing efforts on the 4x4 sector. The Dunehawk concept is Nissan's solution to matching full MPV (multi-purpose vehicle) versatility with the dynamic attributes of an SUV. "Today customers are more demanding than ever," said Patrick Pelata, Executive Vice President, Nissan Motor Co. and Chairman, Management Committee for Europe. "They want vehicles which can give them freedom. Which enable them to be active. Which allow them to engage in real outdoor pursuits. So they need off-road ability in addition to refinement, comfort, and



Nissan Dunehawk

quality of a passenger car." This 4795-mm (188.7-in) long, 1900-mm (74.8-in) wide seven-seater has off-road ability thanks to its rugged chassis, ground clearance, and advanced electronically controlled ALL-Mode 4x4 system. It has a roomy interior with a motorized fold-flat flexible seating system with a hideaway 3rd row seat, overhead center console, dual vertical sunroof, and advanced N-Form system centralizing all onboard technology. There are no door handles or door mirrors to disrupt the Dunehawk's surfaces. The doors open electrically by brushing a pad on the flanks of the Dunehawk, while rear-facing cameras with pop-up screens at either end of the dashboard aid the driver with what's happening behind the vehicle.

Jennifer Newton

Mitsubishi i

Named for "myself" and "love" ("ai" means love in Japanese) and also for "innovation, imagination, and intelligence," **Mitsubishi's i** concept challenges the conventions of small-car design and engineering. It offers a spaciousness only seen so far in vehicles of the next larger segment, despite its compactness. All accomplished without detracting from Mitsubishi Motors visual identity or doing away with its Japanese modern design philosophy. Before pen even met paper, designers knew that i's body would play an important part in the overall objective of fuel economy and safety and at the same time generate emotions. Mitsubishi designers and engineers focused on providing i with the highest level of passive safety for occupants, and also tackled the new frontier of automotive safety—pedestrian protection—with the front of the body shape. To breath life into the i, a completely new powertrain was developed. The rear-mounted 1.0-L, three-cylinder gas-injection engine, with electronic throttle control and exhaust



Citroën C-Airlounge



of their softly rounded form, the concepts provide a solution, says Renault, to the problem of MPVs, whose lack of aerodynamics has a negative impact on fuel consumption. The Be Bops are characterized by one single flowing line. Although half of their bodywork parts are in common, these concept vehicles have very different personalities. Be Bop SUV—as its name indicates—is a sport utility vehicle intended as much for city life as off-road driving. With its 210-mm (8.3-in) ground clearance and four-wheel drive, few obstacles stand in its way. Powering the SUV is a four-cylinder, 84-kW (115-hp) 1.6-L engine. The Renault Sport, like its name indicates, is a sporting, compact MPV. All front-end designs are specific, with flowing lines that prove sporty handling and soft forms can go together. The radiator grill adds to its sporty personality, as does its 165-kW (225-hp) 2.0-L turbocharged engine with 300 N•m (220 lb•ft). Renault's Touch

direction. Likely to be central to those decisions is the Jaguar R-D6 concept car revealed at Frankfurt.

In some ways, Jaguar's strength is its ability to design and build archetypal British high-performance cars. If it breaks away from that proven recipe for success, it risks having to re-establish itself, which would be no mean feat. To provide some guidance for Jaguar and PAG senior executives, the R-D6 was fielded to gain reaction from the general public, established customers, and the media. The car is not just about distinctive aesthetics, including rear doors hinged at their trailing edges, but is also



Renault Be Bop SUV (above) and MPV

a technology *tour de force* incorporating aluminum and composite materials for both chassis and body; the car is based on a shortened XJ platform. Significantly, it also is

powered by a new 2.7-L V6 twin-turbo high-pressure common-rail diesel engine, the fruit of an intensive collaborative agreement between Ford and PSA Peugeot Citroën, although Jaguar design engineers had major input. The engine has a compacted graphite iron (CGI) cylinder block and, in the concept car, is tuned to produce 230 hp (172 kW) and 500 N•m (369 lb•ft), which would give the R-D6, having a mass of 1500 kg (3310 lb), a sub-six-second time from 0-97 km/h (0-60 mph) and the necessity to electronically limit its top speed to 250 km/h (155 mph). The production version for next year's S-Type will be less exotic.

The R-D6 is a relatively small car on a wheelbase of 2840 mm (111.8 in) and with an overall length of 4330 mm (170.5 in), which means that it is



Design concept used in both Be Bops encourages intuitive use of controls. According to Louis Schweitzer, Renault Chairman and Chief Executive Officer, the Be Bops aren't meant for production, but because Renault is showing an MPV, he says it means the company is thinking about a midsize MPV and at some point in time may present such a vehicle.

Jennifer Newton

Jaguar R-D6

An axiom particularly apposite to the automotive industry is that "difficult decisions are the privilege of rank." At Jaguar, and Ford's Premier Automotive Group (PAG), some very high ranking executives may soon have to make potentially difficult decisions about the company's design and engineering



Mitsubishi i

gas recirculation, generates 50 kW (68 hp). The i's engine is mated with a lightweight, new-generation continuously variable transmission (CVT). The i can accelerate from 0 to 100 km/h (0 to 62 mph) in 10.9 s. Over the middle of the i's central panel, an arched strip calls for the driver to touch in order to control certain functions. This technology is similar to the "touch screen" function of some computers, making the control interface user-friendly. Scheduled to appear on the Japanese market in fall 2005, i could later make its way to Europe as well.

Jennifer Newton

Renault Be Bop

The Renault Be Bop SUV and Be Bop Renault Sport concepts are two interpretations of the compact MPV theme. Both combine rounded forms with structured lines for greater aerodynamic efficiency. These 4-m (13.1-ft) long cars are reminiscent of a water droplet; their style suggests movement and sleekness. "The water droplet is a superb symbol of aerodynamic purity," explained Michel Jardin, Director of Concept Car Design for Renault. Because



Jaguar R-D6

shorter than the X-Type sedan but classed by the company as a four-seater. It is also described as a "coupe," despite having four doors—something Mercedes-Benz has done with its Vision CLS concept coupe. The frontal signature of the car has elements of S-Type, Mk II, and 1950s C-Type sports-race car. Front and rear lights use LED technology. Jaguar has given the concept some interesting details such as flush-mounted door handles pivoted at their leading edge and linked to actuators to open the doors.

Jaguar's determination to pursue aluminum as its material of choice following the introduction of the new XJ, which uses the material, is underlined by the R-D6. Castings such as the front suspension turrets have also benefited from techniques used in the new XJ. The concept has large 21-in wheels machined from solid aluminum.

The interior of the R-D6 is certainly not traditional Jaguar, although it does have wood and leather. The door trim incorporates aluminum and two types of leather and American walnut wood veneer. There is plenty of aluminum on the dashboard and around the instruments, of which the tachometer is the dominant element. Jaguar describes the dials as having a white ceramic appearance. The steering wheel trim is aluminum, leather, and piano black wood. A milled aluminum gearshift lever is fitted (the car has a six-speed manual gearbox) and topped by a swiveling section. Moved to one side, it reveals the engine start button—but not, alas, an ejection seat initiator.

Stuart Birch



Mercedes-Benz Vision CLS

That apparent conflict in terms, the four-door coupe concept, was alive and well at Frankfurt. Jaguar had its R-D6 and Mercedes-Benz the Vision CLS, which, unlike the Jaguar, made no pretence that it had anything other than two doors on each side. Based on the E-Class, the CLS looks very much like a production program for MY2005, and DaimlerChrysler was doing nothing at Frankfurt to put that in doubt. Interestingly, the Mercedes, like the Jaguar, was shown with a twin-turbo six-cylinder diesel engine, in the Mercedes producing 195 kW (261 hp) and 560 N•m (413 lb•ft) from 2000 rpm to give a 0-100 km/h (0-62 mph) time of 6.4 s, and, as with the Jaguar, a 250-km/h (155-mph)

electronically limited top speed. Fuel consumption is 7.5 L/100 km (31 mpg), and the engine is EU 4 compliant. For production, there would be a choice of V6 and V8 diesel and gasoline engines. The concept is fitted with Mercedes' 7-G Tronic automatic gearbox, and the production car may be offered with four-wheel drive.

Although the car is based on the E-Class chassis (including its air suspension) with the same 2854-mm (112.4-in) wheelbase, it is longer (4910 mm or 193.3 in), wider (1851 mm or 72.9 in), and lower (1391 mm or 54.8 in) than its

sibling sedan. It has a large trunk with 470-L (16.6-ft³) capacity. The car's exterior styling is a mix of sharply delineated crease lines and a smooth flowing profile. The interior is designed for four adults. Interior highlights include cream seat trim, a light oak finish for the dashboard, and a large panoramic glass roof. In an effort to reduce driver workload and simplify control usage, Mercedes is trying four illuminated paddles mounted on the steering wheel to activate several functions including the radio, navigation system, and telephone. Rear-seat passenger space (for two) is good in the CLS despite its sloping roofline, with headroom of 924 mm (36.4 in) and shoulder room of 1422 mm (56.0 in). Space between front and rear seat reference points is 829 mm (32.6 in).

Stuart Birch



Mercedes-Benz
Vision CLS





(15.4 lb/hp), 0-100 km/h (0-62 mph) acceleration in 8.6 s, and fuel consumption that never exceeds 7.3 L/100 km (32 mpg) over a combined European driving cycle. Suspension is by McPherson telescopic struts, coaxial coil springs, and lower wishbones in front and longitudinal arms with an antiroll bar in back. Though there are four disc brakes and ABS, antislip or stability control devices have been left out to retain "the purity" of the original.

Kevin Jost

Saab 9-3 Sport-Hatch

Saab designed its five-door 9-3 Sport-Hatch to offer driver-focused performance and innovative load-carrying features, but with hatchback-like proportions reminiscent of the original 900. Designed for customers with active lifestyles, it features integrated lugs just below the rear screen on the tailgate that combine with swiveling points on the trailing edge of the roof to accommodate mounting brackets for bicycles once the front wheels are removed. An extra compartment under the rear cargo deck provides 120 L (4.2 ft³) of extra storage separate from the rest of the trunk. The concept has a glass roof and twin folding rear sports seats. LEDs are used for the headlamps (in three horizontal "fins") as well as the tail and stop lights.

The interior is highlighted by a translucent "clear zone" made of a smoke-tinted, composite material covering the main instrument panel, center stack, front and rear floor-mounted consoles,

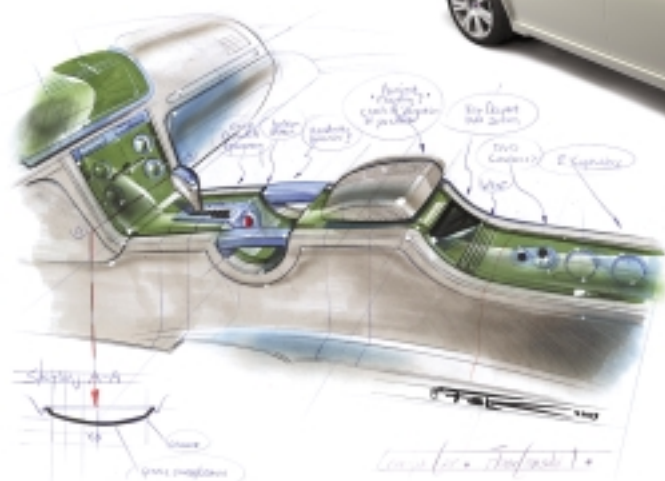
storage compartment between the rear seats, and rear cargo deck. Up front, the clear zone acts as a touch screen to provide information on demand. It is a further development of Saab's current Night Panel feature and removes much of the visual clutter associated with buttons and controls. Essential driver information is presented through three portholes in the clear zone surface. The concept's advanced infotainment functions use the fiber-optic electronic platform from the 9-3 for satellite navigation, front and rear TV and DVD screens, and Bluetooth connectivity with e-mail and Internet access.

Vehicle propulsion is by a 250-hp (184-kW) version of the 2.0-L turbo unit introduced in the 9-3 Sport Sedan, here with direct injection, variable valve timing, and a twin-scroll turbocharger. It is mated to a Sentronic +2 automatic transmission. The introduction of direct injection improves combustion, fuel consumption, and low-end torque (by about 15% up to 1500 rpm). Apart from improving fuel consumption at full- and part-load throttle by up to 5%, the continuously variable cam phasers that control both inlet and exhaust valves further contribute to better low-end torque. The first-for-Saab use of a twin-scroll turbocharger more effectively harnesses exhaust pulse energy by separating the gas flow into two (vs. one) channels to drive a titanium-aluminum alloy turbine selected for its low inertia.

Kevin Jost



Saab 9-3 Sport-Hatch



Lancia Fulvia

Lancia Fulvia

At the 1965 Geneva Motor Show, Lancia introduced the original Fulvia Coupé with a novel engine configuration of four cylinders in a narrow V housed in a front subframe, front double-wishbone suspension, and four-wheel disc brakes with a dual hydraulic circuit and brake servo. The road car was later adapted for racing, introducing the brand's HF performance tag.

At the 2003 Frankfurt Motor Show, Lancia showed a Fulvia prototype that recreates the original as though it had been left free to evolve without interruption. The post-modern reworking of the original car was aided by suppliers including Akzo Nobel, Bose, Magneti Marelli, Pirelli, PPG, Shafenaker, and Trussardi. The dimensions and three-box shape of the Fulvia Coupé show car are very close to the original's, but the track has been broadened to give the car greater stability. The interior has a Seventies feel.

All the car's exterior parts have been developed to keep down drag to produce a high top speed of 213 km/h (132 mph) from a relatively modest 140-kW (103-hp) 1.8-L powerplant. Body panels in aluminum allow vehicle mass to be kept low at 990 kg (2180 lb) for a good mass-to-power ratio of 7 kg/hp

Hyundai CCS

Based upon the 2.7 Coupe (Tiburon in the U.S.), the **Hyundai CCS** Convertible study is an exploration of both styling and technical possibilities. The main feature of this vehicle is the three-phase slide and fold roof developed by **Karmann**. At the touch of a button, the driver can change from glass roof to open roof to convertible. In mixed weather the driver touches one button to send the glass roof sliding back over the rear window. Sliding outside rather than inside maximizes the rear headroom. From open roof to full convertible configuration demands only the touch of a second button. The rear screen folds with the forward roof supports under the forward-opening rear decklid, while at the same time adjusting the sliding roof panel to give maximum luggage space. The system is also remote controlled.

The folding process appears simple, which is a key feature. The system has fewer moving parts and pivot points than earlier systems. The result is that



Hyundai CCS

operational efficiency is increased, mass is reduced, and the parcel shelf moves only within a single plane rather than lifting or twisting. The mass increase over the normal coupe, including all hydraulic and electric components, has been kept below 140 kg (310 lb).

Certain other styling modifications have been included in the study. Not only are the rear light clusters new, the transparent front clusters add a higher level of visual refinement. New 18-in wheels with **Michelin** tires have a lighter, sportier look. A new color, Warm Silver, was developed for the paintwork, while the paint itself is highlighted by glass micro-elements.



Both the steering wheel and dashboard are covered in brown leather. The metallic elements—including the ventilation and A/C outlets, speaker surrounds, and bezels—have been specially treated with a “warm glow” process. A 280-W Becker sound system with Infinity speakers is included.

According to Karmann, the major challenge was the rear suspension, which was vertically aligned with a fairly long travel. Working with Hyundai, they had to adapt and shorten it without losing the original elasticity and smoothness.

David Alexander

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