Jaguar's new XK weighs in

Like an airplane, light weight, high power, and refined aerodynamics were key design criteria for **Jaguar**'s new XK sports coupe unveiled at the Frankfurt Motor Show in September. The car continues the use of riveted and epoxy bonded technology (extrapolated from the aerospace industry) already applied to the current XJ sedan to create an aluminum monocoque body structure. Aluminum is also used for castings, extrusions, and body panels. New jointing technologies have been developed by Jaguar and its suppliers. The resulting curb mass is 1595 kg (3516 lb), compared with 1685 kg (3715 lb) for the outgoing model, and the body shell is 31% stiffer.

Jaguar's new XK coupe has an aluminum monocoque, for lower mass than the outgoing model, and a side treatment including front wing "power vents" similar to those used by sister company Land Rover for its Range Rover.

Interior décor of the new XK blends traditional Jaguar luxury and sportiness.

The new Jaguar XK coupe has a "tailgate"— as did the XKE of the 1960s.

Scheduled for market launch next March, Jaguar has released basic details of the 2+2 seat XK, which is powered by a naturally aspirated 4.2-L 224-kW (300-hp) V8. Maximum torque is 420 N·m (310 lb·ft) at 4100 rpm, with 85% of that available between 2000 and 6000 rpm. Although based on the current XJ's engine, it is said by Jaguar to have undergone significant development, including new fuel-injection technology. It meets Euro 4 emissions legislation and required U.S. regulations. CO_2 emissions are 6% better than those of the outgoing XK8.

Performance figures include a 0-100 km/h (0-62 mph) time of 6.2 s and an electronically limited top speed of 250 km/h (155 mph). The standing quarter mile is covered in 14.4 s, less than half a second slower than the XKR, the 298-kW (400-hp) supercharged version of the previous XK. Power-to-weight ratio is 10% better than the new XK's predecessor.

The engine drives through a **ZF** six-speed auto transmission with steering-wheel-mounted paddles for manual shifting. Software includes a torque enhancement control that blips the throttle during manual shifts when necessary. The facility also operates in Sport Auto mode. With the introduction of paddles, the J-gate shift pattern, long used by Jaguar, has been abandoned in favor of a more conventional selector layout, this time in an L pattern.

The XK's braking system is new, with larger ventilated discs than those of the old car. Four-channel ABS is used, varying brake pressure at each wheel as necessary via analog valves in the hydraulic control unit for maximum retardation and improved steering input. Electronic Brake Force Distribution and Hydraulic Brake Assist to boost brake pressure in an emergency application are also fitted. An electronic park brake is used, and steering is Servotronic 2.

The XK has an aluminum tailgate, pivoting on two hinges, and what Jaguar terms a "pedestrian deployable" hood. It

deploys upwards, away from its trailing edge in the event of a pedestrian impact, forming a safety area above the engine.

Jaguar regards the styling of the new car as being more akin to that of the XKE coupe (E-Type) of the 1960s than the former XK, and it closely resembles the Advanced Lightweight Coupe concept seen at the 2005 Detroit Auto Show. It has greater interior space than its predecessor, with a longer, 2752-mm (108.3-in) wheelbase, wider track, and higher roofline. Overall length is 4791 mm (188.6 in).

Equipment offered includes keyless start with push-button engine firing; active lighting; tire-pressure monitoring and run-flat tires; 7-in touch screen for climate, audio, navigation, and telephone modes; and adaptive cruise control with Forward Alert to warn of a potential collision.

A 3.5-L V8 engine will be available for some markets, and an XK convertible will be added later.

Stuart Birch

Renault designs "tall coupe" concept

The concept designs of Patrick le Quément, Senior Vice President, **Renault** Corporate Design, and his team invariably point to how the company's production cars will appear. Some of their concept work, such as the bow rear window of the 1998 Vel Satis Coupe concept, looked unlikely but was used successfully on production models, notably for the Mégane to create a distinctive, high-volume model.

One of the latest Renault concepts is the premium-level, four-wheel-drive Egeus, which could form the basis of a production version within two years, probably using an Alliance platform shared with **Nissan**.

"It is an SUV for city driving and the open road, a sort of 'tall coupe' that combines driving pleasure with elegance and sportiness," said le Quément in describing the Egeus concept.

Although categorized as an SUV with off-road capability, the car has a long, softly rounded hood styled to enhance the coupe message, and its visual cues associate it with Renault's 2004 Wind and Fluence models.

Egeus has no front grille, regarded by the design team as "too brash" for such a high-level design. Instead, cooling air enters via inlets beneath the headlamps. The hood flows into the well-rounded windshield, which in turn merges with a glazed roof, and the rear windshield is bubble shaped to achieve a continuous line with the front windshield. There is no B-pillar. The car has broad rear fenders and large, 22-in wheels.

The interior borders on the minimalist. Its four individual seats have leather upholstery in woven beige tones described

Egeus, Renault's SUV concept, incorporates advanced lighting, backward-opening rear doors, and no B-pillar.

by the designers as being inspired by a "pixelated image of a setting sun." The center console is extended into the rear of the car, bisecting the interior.

"The wraparound seats guarantee a high level of comfort and stand out for their innovative functions," said le Quément. "The front seats pivot outwards and can be lowered 70 mm (2.8 in) for easiest possible access. The rear-hinged doors, plus the absence of a center pillar, give unencumbered access to the rear seats." **Stabilus** hydraulic door-stop technology is used to hold a door in any position regardless of tilt.

An interactive display at the top of the dashboard provides passengers with information including a detailed map. For several years, Renault designers have focused on the application of intuitive controls via the company's Touch Design haptic philosophy. Steering wheel controls mirror the natural curve of the hand. The car's GPS system continuously calculates recommended speed, which is shown in the center of the speedometer dial; LED diodes around it flash to alert the driver if these speeds are exceeded.

The Egeus has a split-level trunk with lift-up top and motorized drop-down lower section, which includes a sliding tray that is electrically height adjustable to ease loading of heavy or bulky items.

External side-door handles are flush-fitting but are linked to an optical sensor; when a hand is detected in the immediate vicinity, they extend a few centimeters to enable operation.

The front seats of the Egeus turn and tilt to aid access and egress.

The Egeus' instruments include a speedometer with a warning for recommended speed.

Egeus is powered by a 250-bhp (187-kW) 3.0-L V6 turbodiesel mounted longitudinally, driving through a seven-speed automatic transmission. Tires are **Michelin** Eden Weiss with a compact closed tread, long shallow grooves to help reduce road noise, and elements of the front tires' tread have been designed for enhanced wet-road grip. The Egeus uses the PAX run-flat system, negating the need for a spare wheel. Lightweight alloy wheel rims have been specially developed by **Montupet**.

Egeus' boomerang-shaped headlamps incorporate running lights and turn indicators using LED diodes in different colors. High-performance diodes are used for the headlights, the amount and direction dependent on steering angle. On motorways, the diodes are automatically activated and modulated to maintain what the design team describes as a constant and optimal range without dazzle. The color of the light has been developed to be similar to that of daylight. The diodes are said by Renault to have a "significantly longer" life than other light sources. The lighting system was developed by Renault in partnership with **Valeo**.

Stuart Birch

Mercedes-Benz launches its GST

There was a time when cars slotted into sharply delineated categories: sedan, station wagon, sports car. With the evolution of hatchback, wagon, and sedan, designs started to merge, and the arrival of the SUV blurred the picture further. Crossover vehicles are now bringing added change.

Mercedes-Benz, though, insists that its new R-Class (and smaller sibling, the B-Class) is not a crossover. The company describes it as a Grand Sports Tourer (GST) because it has the comfort of a luxury saloon and versatility of a wagon but with greater interior space and four-wheel drive.

Built in long and (for Europe and other markets) short wheelbase forms at **DaimlerChrysler**'s Tuscaloosa, AL, plant, the six-seat R-Class is a two-box design that appears to have more in common with a wagon than an SUV or minivan. At 5157 mm (203.0 in), it is slightly longer overall than the 2005 S-Class, and standing 1656 mm (65.2 in) tall and with a wheelbase (long model) of 3215 mm (126.6 in), it has a very prominent road presence, its curving semi-coupe side window treatment giving it added distinction.

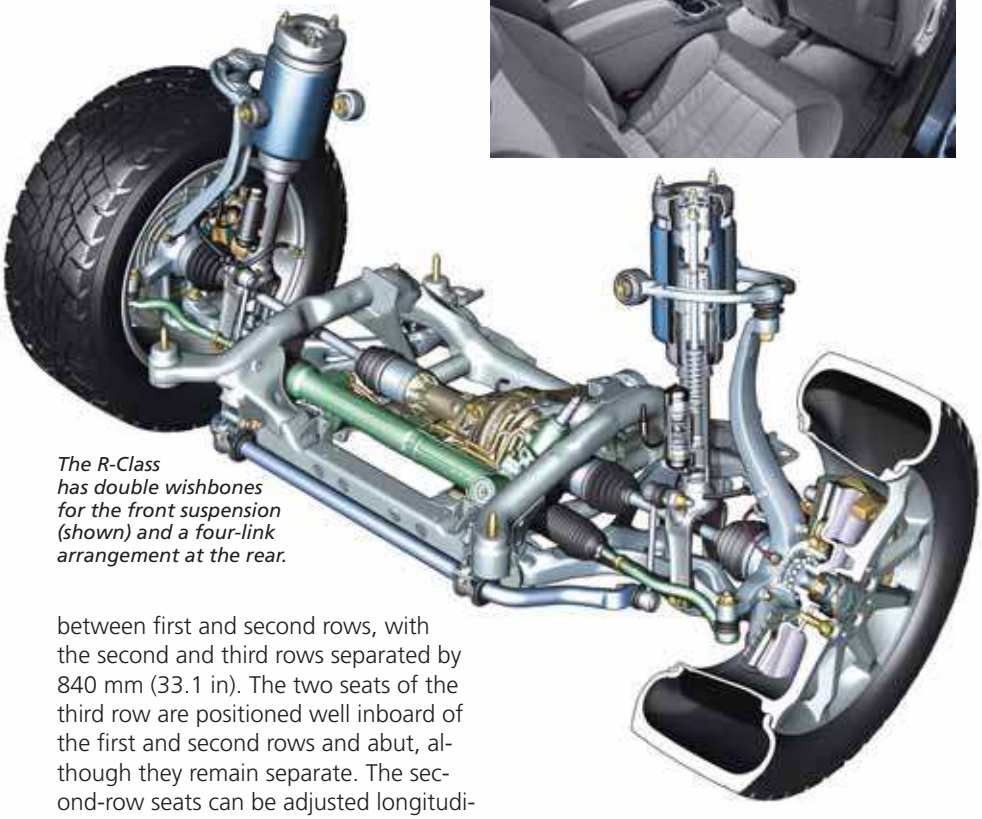
It is three years since Mercedes revealed the big GST concept, and it was immediately clear that it was slated for production, with the U.S. as its likely major market.

The R-Class is very much an "inside story," because its design majors on the interior, or "dynamic space" as Mercedes calls it. Configuration is six individual seats in three rows, the rear four folding to create a load space 2.2 m (7.2 ft) long. Seat spacing measures 920 mm (36.2 in)

The long-wheelbase Mercedes-Benz R-Class is slightly longer overall than a 2005 S-Class.

Mercedes-Benz concentrated on the R-Class's aerodynamics to achieve a Cd of 0.31.

Luxury and space are the keynotes of the Mercedes-Benz R-Class's interior.



The R-Class has double wishbones for the front suspension (shown) and a four-link arrangement at the rear.

between first and second rows, with the second and third rows separated by 840 mm (33.1 in). The two seats of the third row are positioned well inboard of the first and second rows and abut, although they remain separate. The second-row seats can be adjusted longitudinally to increase seat spacing to 990 mm (39.0 in). Maximum distance between second and third seat rows is 920 mm (36.2 in). Headroom at the rear is a maximum 1027 mm (40.4 in), shoulder room in front reaches 1530 mm (60.2 in) and 1514 mm (59.6 in) in the rear.

The effect of this space and the car's luxurious, individual seats is to create a lounge-like area. With the four rear seats folded flat (a quick and easy operation and an object lesson for some other manufacturers), load capacity reaches 2385 L (84.2 ft^3) using the VDA method. With all seats in use, there is still 314 L (11.1 ft^3) of available luggage space.

An optional DVD/CD player gives rear-seat passengers their own entertainment system. Color screens and headphone connections are integrated into the backs of the front-seat head restraints.

Also optional is an opening, panoramic glass sunroof, which covers 1.2 m^2 (12.9 ft^2). Dual-zone (multi-zone is an option) air conditioning is fitted with a separate control panel for the rear. The multi-zone system has 12 sensors and an auxiliary booster blower to look after settings chosen by driver, front passenger, and rear-seat occupants; a separate air conditioning unit can be specified for the third seat row.

Gasoline engines at launch are a 200-kW (268-hp) 3.5-L V6 first used in the latest SLK, and a torquey—460 N·m (339 lb·ft) from 2700 to 4750 rpm—225-kW (302-hp) 5.0-L V8, which will get the car to 100 km/h (62 mph) in 7 s and on to a 245-km/h (152-mph) maximum; combined fuel consumption is 13.3 L/100 km. A 165-kW (221-hp) 3.0-L V6 diesel with 510 N·m (lb·ft), available from 1600 rpm, will follow, with combined fuel consumption of 9.3 L/100 km. Later, the newly announced 375-kW (503-hp) AMG V8 gasoline engine, designated 6.3-L by Mercedes although its displacement is 6208 cm^3, is expected to be offered. Curb mass of the R500 with 5.0-L V8 engine is 2240 kg (4940 lb).

All initial versions of the R-Class (no details yet for the AMG unit) have Mercedes 7G-TRONIC seven-speed automatic transmissions with a steering-column-mounted selector and steering-wheel-spoke buttons for manual operation. All-wheel drive is permanent via Mercedes' established electronically controlled 4ETS traction system, and ESP (electronic stability program) is fitted.

The car has an Adaptive Damping System (ADS) and air suspension is standard for the rear wheels, but Airmatic all-round air suspension is an option. The air system allows the car's body to be lifted 50 mm (2.0 in) when traversing uneven surfaces at low speed. At speeds above 120 km/h (75 mph), the body settles 20 mm (0.8 in) lower to improve aerodynamics and stability. The R500 front axle incorporates double wishbones, and the rear a four-link layout.

Safety systems include Pre-Safe as an option. If it detects a potential impact via critical handling behavior, it automatically tightens seatbelts, adjusts the passenger's seatback angle, and closes the side windows and sliding roof. The car is also available with Neck-Pro, which slides the head restraints forward 44 mm (1.7 in) and upwards 30 mm (1.2 in) in the event of a rear impact.

Stuart Birch

Top-down management at Mini

According to **BMW**, a new market segment was created in the U.S. when the **Mini** was introduced—the premium small car. Including the John Cooper Works and 40th anniversary packages, the 2005 convertible was the fourth production launch in two years when it arrived at the end of 2004.

Two years after the Mini was first launched in the U.S., convertible versions of both the Cooper and Cooper S are available for the 2005 model year.

Gerd Hildebrand, Head of Mini Design, pointed out that multiple variants are a Mini tradition. Many were built by specialist coach builders, but **Austin** also produced its share. The first entrant in the premium small car brand builds on this heritage.

"You must be able to see, feel, hear, smell, and taste that this is a Mini," said Hildebrand. "First impression comes from the looking at the vehicle. Then get inside and feel the quality. Then hear the engine and smell expensive material. The final 'taste test' is to drive it, *i.e.* eat the road."

Hildebrand describes his design philosophy as "head-to-hand-to-paper." He used computer-aided styling to meet the aggressive time goals, but specialists in **Alias** software were hired to do the work of creating computer models from sketches so that his designers could concentrate on creativity—putting their ideas on paper. A Powerwall from **Fakespace Systems** was used for design reviews, and then design engineers created engineering CAD models with **ICEM** Surf and CATIA from **Dassault Systèmes**. Clay models were milled from the CAD data, fine-tuned by hand, and the modifications scanned back into CAD.

"All these activities were going on simultaneously, constantly refining, until the engineering manager said stop," said Hildebrand.

Initial sketching was extensive. The Mini "proportion rectangle" made it tricky to design the convertible roof to maintain the distinctive Mini profile. Initially the roll bar was located at the B-pillar, but then it was moved back to give more open space for the passengers. The goal was always an integrated design solution—a real four-seater. The convertible top mechanism was developed by BMW engineers together with experts from **Webasto**.

"The Mini hardtop has a distinctive shape that the convertible mimics," said Product Manager Jeff Stracco. "The rear seats can still fold down because the underlying structure is stiff enough. A drop-down trunk lid similar in style to the original Mini and a pop-top provides easy access to the interior."

The convertible top is fully automatic. In 2.5 s, the first 16 in (400 mm) slides back, effectively creating a sunroof that can be operated at speeds up to 75 mph (120 km/h). Then in another 13 s the rest of the roof folds down. The convertible top has a heated glass rear window. The parcel shelf, with low and high positions, must be in the low position for the top to go down. The shelf protects the luggage, and the top stows above it.

With the roof up, the lower rear edge of the trunk top panel can be unlatched and popped up 35° for access to the trunk and rear seat area.

The body structure has been designed to provide a stiff platform but still allow interior flexibility, not requiring a cross-member at the top of the trunk opening or a bulkhead behind the rear seats. Substantial body stiffness without a roof structure comes from reinforced A-pillars, a lower B-pillar crossbeam, floorpan stiffeners, and thickened sills. A high-strength aluminum roll hoop is integrated with the rear-seat headrests.

When people buy a Mini convertible they must sign a contract in which they promise to keep the top down as long as possible.

David Alexander

The Mini convertible roof has a z-fold design that is fully automatic and goes from closed to open in just over 15 s.

Extra reinforcements for the Mini convertible body structure can be seen in red. The Integrated rear-seat headrests and roll bar are made of high-strength aluminum.

Cayman shows its teeth

A new **Porsche** was once a rare event; now they almost seem to come along in droves. The latest is the Cayman S, essentially a coupe version of the Boxster, although Porsche insists that it is far more, establishing a model in its own right.

The Cayman, publicly revealed at the Frankfurt Motor Show last month, is powerful, with a newly developed 3.4-L, mid-mounted, six-cylinder boxer engine putting out 217 kW (291 hp). By comparison, the Boxster S gets 206 kW (276 hp) from 3.2 L. Particular emphasis was placed on generous power delivery at lower and medium engine speeds. To achieve this, the Cayman engine uses Porsche's VarioCam Plus variable intake

Porsche's new Cayman S coupe gets 40% of its components from the Boxster.

control and valve timing system (previously only available on the 911 engine) and produces 340 N·m (251 lb·ft) between 4400 and 6000 rpm. The engine drives through a standard six-speed manual gearbox or optional five-speed Tiptronic S automatic, having manual shift toggle buttons on the steering wheel spokes.

Performance figures released so far for the 1340-kg (2950-lb) Cayman include a top speed of 275 km/h (171 mph) with a manual transmission and a 0-100 km/h (0-62 mph) time of 5.4 s. Its mass-to-power ratio is 4.6 kg:bhp. Extensive use has been made of aluminum for suspension components. The car has a front axle subframe of pressure-cast aluminum, said

Interior of Cayman S follows Porsche's current design philosophy.

The Cayman S's spoiler deploys at 120 km/h (75 mph).

by Porsche to be 30% lighter than steel with the same function and stiffness. The suspension is very similar to that of the Boxster but modified for compatibility with the coupe, and they share the same 2415-mm (95.1-in) wheelbase.

Porsche Stability Management (PSM) is standard and Porsche Active Suspension Management (PASM) is optional, the system adjusting suspension response to prevailing conditions. It has "normal" and "sport" settings. Ceramic composite brakes are an option on the Cayman S.

The styling of the coupe is sufficiently different from the Boxster and 911 to give it a distinctively individual look. It has an opening tailgate to access a 260-L (9.2-ft^3) luggage compartment in addition to 150 L (5.3 ft^3) of luggage space in the car's nose. Front wings, hood, headlamps, and doors are shared with the Boxster. The roofline echoes that of early 911s, and the car's general compact proportions bear a resemblance to those of the late-1980s 3.2-L Carrera. Vertical air intakes are positioned behind the trailing edges of the doors. The Cayman is 12 mm (0.47 in) longer than the Boxster and 13 mm (0.51 in) taller. A rear spoiler deploys at a speed of 120 km/h (75 mph).

Although the Cayman incorporates a raft of advanced technology, Porsche is

"We consciously refrain from seeking leadership in the use of electronic technologies in areas where we do not see any genuine benefits for the customer," said Porsche's Rainer Wüst.

clear about the limits of its application.

"We consciously refrain from seeking leadership in the use of electronic technologies in areas where we do not see any genuine benefits for the customer," said Rainer Wüst, Project Director, Boxster/Cayman model line, during an introductory briefing on the car's technology. "Steer-by-wire and brake-by-wire systems, for example, simply do not offer the driving feeling you rightly expect of a thoroughbred sports car.

"On the contrary, the active and attentive driver prefers feeling the road and the reactions of his car without any kind of artificial 'filter' in between," added Wüst. "Instead, we consider very carefully where the appropriate use of electronic systems really offers benefits, an example being the PASM."

The system also includes different gas-pedal control lines, hard and soft engine speed governor, and two shift programs for Tiptronic S.

With the sport setting operational, the Cayman's lap times of the Nurburgring are said to be 3 s faster than with the standard setting. PASM includes a vertical control module for minimum body movement; a lane-change module for "dynamic and fast" maneuvers; lateral acceleration module to reduce roll; and brake module with anti-dive facility, which also maximizes tire/road contact under braking.

To achieve required active safety levels while ensuring dynamic performance in bends, Porsche lists as priorities: precise steering, sensitive spring/damper settings, a high-performance brake system, and robust control technology with specific on-demand application.

The development test program for the Cayman included more than 10,000 h on rigs and 2 million km (1.24 million mi) on roads and tracks.

Stuart Birch