Mazda Xedos 6

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Introduction

INTRODUCTION

Mazda Motor Corporation's dedication to the European market is reflected in several recent products such as the Mazda 626, MX-6 and MX-3. They enhance Mazda's reputation for producing automobiles combining unique value with high technical standards, reinforcing Mazda's image as a provider of innovative and distinctive automobiles.

In May 1990, Mazda opened its European R&D centre in Germany, completing a four-point R&D network with bases in Hiroshima and Yokohama in Japan, and in North America and Europe. Through this network Mazda is in a unique position to identify trends in major markets worldwide and to develop products tailored to individual regional markets.

Certainly the most visible example of Mazda's European commitment has to be the announcement of Mazda's all-new sedan, the Xedos 6.

The Xedos 6 was designed and developed from the basic concept of achieving "a personal, compact, high-quality sedan." It is intended to fully meet the diverse demands of today' s discerning, younger buyers in Europe.

The Xedos 6's Attributes

The Xedos 6 represents Mazda' s willingness to break out of the mold by creating an all-new market segment. It is no ordinary compact 4-door sedan. Rather it creates and defines a compact luxury segment that is totally in tune with the times… and the future. The Xedos 6 embodies a mature and intelligent approach to automotive design backed up by an uncompromising commitment to quality.

The Xedos 6 is a 3-dimensional representation of the automobile as a work of art. Mazda' s most advanced technologies have produced a car with outstanding engineering integrity, with an elegance and style that set it apart from existing

compact luxury sedans. Its fluid, seductive lines are undeniably alluring and irresistible.

The Xedos 6 is a deeply satisfying driving experience. All new 2.0-litre V-6 and 1.6-litre inline 4-cylinder engines deliver power with silky smoothness complemented by confidence-inspiring handling characteristics. Together they provide impeccable driving stability for relaxed long-distance cruising, while retaining the lively acceleration that brings driving pleasure to every kilometre.

Suppression of noise, vibration and harshness was vigorously pursued in the design and development of the Xedos 6.

Through controlled combustion and advanced engine management and fuel injection systems, the new engines are clean burning and fuel efficient.

The Xedos 6 adopts the latest in active and passive safety measures. The Xedos 6's rigid body with controlled energy absorption characteristics and softly contoured interior surfaces provide better protection in case of an accident.

THE XEDOS 6 IN BRIEF

The Xedos 6 is a personal, compact, high-quality sedan offering elegance and elan. It seats four adults in superb comfort with sufficient room in the rear even for a third passenger.

The Xedos 6 is built on a 2,610 mm wheelbase; overall length is 4,560 mm. Overall width is 1,700 mm and the car features wide tracks of 1,470 mm front and 1,480 mm rear. The 1.6-litre version has tracks that are 10 mm wider front and rear. Overall width is 1,700 mm. Overall height of the 2.0-litre model is 1,355 mm while that of the 1.6-1itre is 10 mm less.

Two entirely new engines are offered in the Xedos 6, both mounted transversely and driving the front wheels via equal-length half shafts.

The mainstream Type-K, DOHC, 24-valve, electronically fuel injected, 2.0-litre V-6 pumps out 146 bhp (DIN ps) at 6,000 rpm and maximum torque of 175 Nm at 5,000 rpm. The base engine is the Type-B6D, DOHC, 16-valve, electronically fuel injected, inline 4-cylinder. This 1.6-litre engine produces 114 bhp (DIN ps) at 6,500 rpm and maximum torque of 139 Nm at 4,600 rpm on high octane (95 RON) gasoline.

Both engines are offered with a choice of manual or automatic transmission. The 5-speed manual features internal refinements and improved shift linkage. The 4-speed automatie transaxle is Mazda's new-generation electronically controlled automatic transmission with torque converter lockup. Its sophisticated electronic control automatically selects between Normal and Sport modes according to how aggressively the driver depresses the throttle.

Suspension on the Xedos 6 is independent front and rear. MacPherson struts are used up front and struts located by twin trapezoidal links (TTL) are found at the rear. This combination, a hallmark of Mazda front-wheel-drive models, has been re-engineered to provide the Xedos 6 with the optimum combination of handling, road holding, ride comfort and noise isolation.

Engine-rpm-sensing, power assisted rack and pinion steering is standard on all models.

Ventilated front and solid rear disc brakes are standard. A compact, lightweight 4-sensor, 3-channel anti-lock braking system (ABS) is available for all models.

The 1.6-litre models with sunroof are equipped with 185/65R-14 radials with 14 X 5.511 aluminium wheels, while those without sunroof are equipped with 185/65R-14 radials with 14 X 5.511 steel wheels, or with aluminium wheels as an option

The V -6 models (equipped with sunroof as standard) are equipped with 195/60R-15 radials with 15 X 611 aluminium wheels.

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Technical Information

PACKAGING, DIMENSIONS AND WEIGHT

The Xedos 6 embraces a packaging concept that pursues elegance while maximizing efficiency in every area of design and engineering. Its low, wide, compact form brings about excellent aerodynamics, while creating a static and dynamic presence of stunning beauty and sophistication.

The goal was to incorporate levels of functionality, performance and quality that match the established European luxury models, while
keeping outer dimensions as compact as possible.

Ideally, minimizing the size of the engine compartment makes it possible to maximize the space within the cabin. Mounting the drivetrain transversely, as in the Xedos 6, assists in this packaging efficiency. Additionally, from an aerodynamic viewpoint, height and width should be minimized in order to achieve an optimal frontal area projection for better aerodynamic performance. The result of Mazda designers and engineers paying such close attention to the exterior dimensions and endowing the car with such a smoothly contoured and tapered body can be found in the Xedos 6's impressive coefficient of drag, 0.29 with the rear spoiler and 0.30 without.

Conventional wisdom says that restricting overall height means sacrificing passenger comfort. The Xedos 6 resolves this dilemma with a short-nose, long-cabin layout.

By pushing the cowl point forward and moving the backlite rearward, a c1ass-leading length between the accelerator pedal and the rear hip point was achieved. This approach, together with the finely detailed interior design, creates a comfortable space with ample leg room for four adults.

Boot space isn't neglected at the expense of interior volume. There is more than enough room (VDA volume equals 407 litres, 390 litres with the rear strut tower bar)

for a weekly shopping trip or the holiday baggage of a family of four.

Inside, the boot is painted in a colour similar to that of the body and is lined throughout. The underside of the boot lid is also lined and the floor is carpeted.

Equipment is thoughtfully arranged to maximize stowage space and accessibility. Essential tools are contained in a portable tool case stowed in the right side of the boot. The holder for the triangular warning indicator is located at the left side of the boot.

The fuel tank is located in a very safe position under the rear seat, ahead of the rear suspension's transverse members. Tank capacity is 55 litres with the 1.6-litre engine and 60 with the V-6.

Kerb weights range from 1,130 kg for the 1.6-litre with 5-speed manual to 1,230 kg for the model with V-6 and automatic.

EXTERIOR AND AERODYNAMICS

Exterior

A car buyer looks for more than just function in purchasing an automobile. He or she also wants the satisfaction of owning a vehicle that evokes an emotional response and reflects its owner's individual lifestyle. The exterior of the Xedos 6 was designed with this principle firmly in mind.

Smooth lines flow back from the low-slung nose, made possible by newly developed high-stress steels made of a new material and the compactness of both engines. The integrity of line is carried along the curved bonnet to the strongly raked windscreen. The front fenders sweep rearward blending into sensually proportioned rear fenders that enhance the wedge-shaped theme. The greenhouse is smoothly rounded and supported by thin A- and B-pillars and a boldly raked C-pillar that evoke feelings of sportiness and luxury. Horizontal side sills and the curvaceous but short rear deck lend a feeling of balance and stability to the design. At the rear the large flush-mounted taillights sweep around the sides of the car in a design that neatly integrates style with safety. The end product is a new profile of timeless elegance... and quality, reinforced to even the casual observer by the tight tolerances between body panels.

Nothing exemplifies the Xedos 6' s design concept better than the neat, distinctive front grille flanked by low-profile projector-beam headlamps and wrap-around auxiliary lamps. Small, yet large enough for adequate engine cooling, the grille doesn't interrupt the smooth flow of air over the bonnet. Immediately identifiable, it is the focal point of the car's distinctive nose section, communicating automotive elegance, the styling philosophy of the Xedos 6 from today into the future.

Detail Engineering: Separating the Contenders from the Pretenders

To build a world-class automobile, you have to be willing to sweat the details. Mazda's designers and engineers were more than equal to the task. For example, look at the right and left door mirrors. You'd expect them to be symmetrical, but they aren't. The driver-side mirror is longer horizontally, while the passenger-side mirror is

stretched vertically. This clever solution gives ideal rearward vision, and lowers the drag coefficient.

New inner sash door and window-guiding garnish contribute to a flush, low-drag surface. Gutters on the A-pillars keep side windows free from water and secure a clear view of the side-view mirrors.

The side mirrors are equipped with heating elements to remove condensation.

The upper rear window moulding is shaped to act as a rain gutter. The integrated rear spoiler results in improvement in fuel consumption and straight-line stability at high speeds.

Integrating the under-spoiler with the one-piece rear bumper produces an air flow that catches mud thrown up by the tyres, preventing it from adhering to the rear lamp cluster.

Low-profile projector beam headlamp units, 80 mm in height, contribute to the rakish angle of the nose and smooth the line from the lamps to the bonnet. Projector-type fog lamps housed in the front bumper are integrated into the air-dam skirt.

Aerodynamics

The Xedos 6 is a leader in aerodynamics, which makes a significant contribution to the car's superior performance, stability, fuel efficiency and low wind noise. The Mazda designers' attention to the shape and the size of the car results in a low Cd, but even more impressive is the Cd X A, the coefficient of drag multiplied by the frontal area, a much better discriminator of aerodynamic efficiency than the Cd alone. The Xedos 6 is the world's best in the sedan category with a Cd X A = 0.548 (2.0-litre models with the optional rear spoiler). The Xedos 6's road-hugging proportions, wide stance, smoothly contoured body and integrated surfaces all contribute to the car's exceptionally favorable drag and lift characteristics.

To perfect the Xedos 6's aerodynamics, hundreds of hours were spent on the drawing board, in the design studios, in Mazda's full-scale wind tunnel and on the high-speed sections of the Miyoshi proving ground as well as on some of Europe's faster roads. Some of the factors that contribute to this aerodynamic superiority include:

- The sharply raked front windscreen
- Streamlining of the surface air flow between the C-piIlar/quarter panel and the rear fender
- Optimization of the angle of the backlite and the end of the rear deck to prevent airflow over the roof from becoming detached from the body
- Tapering the front bumper/lower facia in plan view
- Optimization and streamlining of the side-sill contour
- Flush-mounting of all lights and lamps
- AerodynamicaIly shaped rear-view mirrors
- Flush-mounted glass with thin mouldings
- Under-the-car air-flow management via a large tray/shield
- Aerodynamic rear bumper integrated with rear under spoiler and (optional) rear upper spoiler

Aerodynamic Characteristics

	Xedos 6	
	1.6i DOHC	2.0i V-6
Drag coefficient, Cd	0.30	0.29 (0.30 w/o spoiler)
Frontal area (A), m2	1.887	1.890
Cd X A	0.566	0.548 (0.567 w/o spoiler)

INTERIOR

The Xedos 6's interior is designed to appeal equally to driver and passengers. Sitting in the snug cockpit with a low yet road-commanding driving position, the driver can feel confident at all speeds and will enjoy stress-free motoring at even 200 km/ho The large windscreen, side windows and backlite provide the driver with excellent outward vision. The compact nature of the 4-cylinder and V-6 engines allows the cowl and bonnet to be lowered, providing the driver with an exceptional sense of the road ahead of hirn. Continuity is provided by the soft wrap-around curves extending from the instrument panel to the front door trim and A-pillar, creating a comfortable cocoon for the driver.

Meanwhile, the Xedos 6's interior allows the passengers to relax in weIl appointed luxury. The instrument panel is designed, like the exterior, with low proportions so as not to hinder all-around vision.

Instrument Panel

Facing the driver are three traditional round gauges. The middle gauge, the largest of the three, is a 240 km/h speedometer. To minimize eye movement, improve readability and to provide the driver with information at a quick glance, the speedometer is 105 mm in diameter. Because it is cable-less, the speedometer does not generate noise or suffer from needle vibration at high speeds.

Flanking the speedometer are two slightly smaller round dials. The one on the left is an 8,000 rpm tachometer, while that on the right houses coolant temperature and fuel level gauges. Outboard of the tachometer and the coolant temperature/fuel level round dials are the various warning lights.

Extensive ergonomie studies on drivers' hand movements were carried out by Mazda engineers. They confirmed that for luxury cars that are often driven long distances at high speeds, those switches should be closest to the steering wheel according to their importance and frequency of use, while other switches can be positioned a little further away as long as they are still within easy reach.

Steering column stalks are used for major lighting and wiper/washer functions.

Located just beside the steering wheel are the switches for auxiliary lights. The front/rear window defrosters and the tightly grouped heater/vent/air conditioner controls, which feature easy-to-decipher pictograms to indicate air flow through the cockpit, are positioned a little further away, yet within easy reach.

Besides considering switch-gear layout, Mazda designers carefully studied ways to improve the feel and operating force of all these controls. This scientific study of the interaction of the driver with the controls in the areas of touch, feel, sound and effort plays a significant role in a driver's instinctive actions in an emergency situation which adds to the Xedos 6's inherent safety.

Nor was the sense of sight neglected, particularly in regard to the fact that automobiles are driven at night as weIl as during the day. Mazda designers added features that ensure easy, fail-safe operation under varying light conditions. For example, almost all switches are illuminated, including the power window switch on the armrest.

To assure comfort and safety, Mazda engineers specified a 230 W large blower motor and optimized duct design which give an air flow rate of 430 m^3/h for improved heating, ventilation, cooling and defogging performance.

The optional air conditioner is charged with HFC 134, a refrigerant which is non-ozone destructive.

Seats

To ensure consistent comfort during long-distance travel as well as during the years of ownership, Mazda designers adopted a "Pullmaflex" structure for the front seat cushions. Developed with the assistance of ergonomic and orthopedic experts, these seats virtually eliminate sag.

The seat cushion padding is suspended by coil springs, providing a superior vibration absorbing structure. To further improve comfort and durability, high-resilience urethane padding is used. S-springs are used in the seat back for improved rigidity and durability . For improved grip and seat durability, the seat backs and cushions feature different urethane padding at the center and the sides.

Front seats are a bucket-type with deep side bolsters for secure support. The rear

seats, while connected by a wide central section are also individually contoured for maximum support and comfort. Unbroken curved surfaces run from rear seat to rear door trim to create a unified space. This approach functionally and psychologically relaxes the occupants, and is reinforced by carefully coordinating interior and body colours.

Cloth material is standard in both 4- and 6-cylinder models, but leather is optional with the V-6.

Fit, Finish and Trim

The interior features high-quality upholstery. Trim design harmonizes perfectly with the flush surfaces of the curved exterior. Another distinguishing feature is the smooth transition between pillar and top trim.

To enhance visual continuity, the interior light and the sun visors are flush-mounted with the ceiling headliner. Assist grips are recessed, and neither mounting clamps nor caps are visible in the Xedos 6 interior.

Driver door and ignition-key cylinder lighting is standard. Dual spot lamps are located in the overhead console (with sunroof). An interior lamp with timer control system and dual spot lamps is positioned in the center of the roof (without sunroof). A trunk compartment lamp illuminates the trunk area.

To prevent unpleasant shock caused by static electricity when exiting the vehicle, each door has a static-electricity absorbing touch panel on the inner handle. By lightly touching this panel, the static electricity flows from the fingers to the static electricity ground panel to the door inner panel and then to the body ground.

Audio System

In order to faithfully reproduce high-fidelity sound, an audio system has been specifically developed for the Xedos 6 after taking the following factors into consideration:

-interior configuration of the body

-optimal location of each speaker

-amplifier tuning to best mate the head units and the five speakers

The audio system features a logic-controlled tape deck with an AM/FM/LW electronic tuner. A 25-Watt amplifier for the speaker in the instrument panel and the four 25-Watt built-in amplifiers give a total dynamic output of 125 Watts.

Regardless of whether the complete system is ordered, the five speakers and the 25-W att amplifier for the center speaker located at the backside of the center panel are included with the Xedos 6.

The tuner features RDS (Radio Data System) and a display indicating the broadcasting station being received. The RDS relay reception system assures excellent reception at all speeds. A press of a button is all that's needed to tune to local traffic reports.

This audio system features an anti-theft system. The user keys in a secret numeric code and operation is not possible until the code is keyed in again if the system is removed. As a further deterrent to theft, an indicator lamp in the system flashes on and off.

Programmed System

The Xedos 6 interior lighting system is programmed to synchronize with a driver's behaviour when getting in or out of the car. That means no more fumbling in the dark for switches. For example, the ignition keyhole and cabin light remain illuminated for a time after the driver closes the door. The cabin lamp also stays lit for a few seconds after the driver shuts the door or until the driver's door is locked, allowing him to check inside for forgotten valuables.

The switches for the power windows and rear defoggers are time-programmed based on the same concept. The rear defogger operates continually for 15 minutes; it then repeats a 2-minute ON and 3-minute OFF sequence to conserve power.

The power windows can be operated for five minutes after the ignition key is switched off or until the open driver's door is closed again.

Central Locking System

Central locking is adopted for the Xedos 6. The system operates from both front doors and the boot.

Convenience is enhanced by a remote-controllocking option. This handy device allows the driver to unlock doors before reaching the car. Instead of a direction-sensitive infrared controller, the Xedos 6 has a radio transmitter. So it does not have to be pointed toward a receiver in the car to function and its operating range is increased.

Moreover, to lock the driver's door the key always must be used (key-Iess locking of the driver's door is not possible) so that the inconvenience of leaving the key inside the car after locking the doors is eliminated.

Anti-theft measures include integrating the key cylinder into the door knob, plus fully covering the door latch to prevent picking tools from being forced between the glass and the door frame

ENGINES

One of the most important factors in the positioning of the Xedos 6 as a personal, compact, high-quality sedan is the powertrain... or in this instance, the powertrains. Two specific engines, a 2.0-litre V-6 and an inline l.6-litre 4-cylinder, are carefully matched with two transmissions, a 5-speed manual gearbox and a 4-speed electronically controlled automatic transaxle. Development objectives included: high performance, quiet motoring, light weight and compactness, while reducing fuel consumption to class-leading levels out of a strong sense of social and environmental awareness.

The Type-K, 2.0i, DOHC, V-6 Engine

The strengths of Mazda's K-series engines include smooth acceleration, compact dimensions, quietness and low fuel consumption. All of these virtues were exploited in the 2.0i, 60-degree V-6 developed for the Xedos 6.

Anticipating demands-both regulatory and market-driven-that would be placed on engines for mid-range cars, Mazda focused its leading-edge technologies on building a highly efficient, high performance engine for a compact, lightweight body shell. It had to deliver the smooth power and torque of a V-6, while achieving low emission levels and returning low fuel consumption.

The resulting power plant showcases several advanced technologies, such as a compact, DOHC, 24-valve configuration and a lower aluminium cylinder block with cast iron bearing cap carriers. The compactness of the new K-series engine is a major factor contributing to the low sloping nose and the long cabin of the Xedos 6.

The 2.0i V-6 was also selected for its ability to propel the Xedos 6 configuration with optimized intake/exhaust efficiency, Mazda at high speeds. By adopting a 4-valve-per-cylinder DOHC engine configuration with optimized intake/exhaust efficiency, Mazda obtained high performance with a naturally aspirated design. The new engine has sufficient torque at low and high speeds, while offering low fuel consumption.

An engine has to "feel right" when the driver steps down on the throttle. To

achieve this feeling, Mazda engineers selected an over square bore X stroke ratio of 78.0 mm by 69.6 mm, respectively, which results in a displacement of 1,995 cc. Additionally, they reduced the engine's reciprocating inertial mass by adapting lightweight pistons and connecting rods. The result is a very responsive power unit with high torque and linear performance. Moreover, the rigidity of its components keeps NVH values to very low levels.

Maximum power of the 2.0i V-6 is 146 ps (DIN) at 6,000 rpm with peak torque of 175 Nm (DIN) at 5,000. The compression ratio is 9.5: 1 and the engine requires 95 octane (RON) unleaded fuel.

Cylinder Block Design

To reduce weight, the cylinder block is diecast aluminium. It features elaborately shaped wall contours and reinforcing ribbing for lightness and exceptional rigidity. For example, instead of relying on external ribs for strength, the oil return passages are designed to act as strengthening ribs. The cylinder block is split horizontally at the crankshaft center. The open-deck upper block has cast-in iron liners whose tops are machined so that they press firmly against the asbestos-free, steel-laminate gasket to ensure tight sealing.

The lower block has cast-in iron bearing-cap carriers which, together with integrally cast aluminium, longitudinal, twin-beams, form an exceptionally sturdy ladder-like structure. This ladder structure precludes thermal distortion of the block, as weIl as providing secure main-bearing support.

The two banks of cylinders are connected by the front bulkheads of the block body, and are further reinforced by an upper cover plate. The rigidly bolted upper and lower blocks thus form a short box-like structure that possesses immense rigidity. It is also light in weight and compact in size.

A secure, vibration-free connection between the engine and transaxle is assured by using radial ribs on the cylinder block that match the transaxle case shape.

Mazda designers selected a forged steel crankshaft for its advantages in performance, durability and quiet running. It is supported by four main bearings, the rearmost being wider than the other three, 22 mm versus 21 mm, to provide secure

support to minimize vibration at this point. The fillet areas of the crankshaft journals are strengthened by the latest deep-roll manufacturing process and the journals are induction hardened for improved reliability. The crankshaft is fitted with a torsional damper within the accessory drive pulley

Pistons are of precision-diecast aluminium with skirts coated with molybdenum disulfide, allowing tighter skirt-to-cylinder wall clearances to minimize piston slap without inducing excessive friction and wear. Each piston is cooled by an oil jet. Connecting rods are forged of high-strength, special alloy steel and are light in weight to reduce reciprocating mass inertia. These rods reduce frictional losses and improve engine smoothness.

A single-disc, dry-plate, hydraulic clutch with diaphragm spring is used with all models. To reduce the force required to depress the clutch pedal, a small lightweight assist spring is newly designed and installed. To improve serviceability and reduce size and weight, the brake and clutch have independent pedal brackets.

Cylinder Head Design

The cylinder heads are precision-diecast aluminium, each carrying twin overhead camshafts. The front-bank exhaust camshaft and the rear-bank intake camshaft are driven by a common single-stage cogged belt incorporating a hydraulic automatic tensioner and two idler wheels. These camshafts, in turn, drive the front-bank intake and rear-bank exhaust camshafts by pairs of "phasing" spur gears with odd and even numbers of teeth (55:56). The driven gear with its one additional tooth meshes tightly against the driving gear; as their "friction gears" name implies, this design eliminates noise-generating backlash. Mazda has considerable expertise in friction gear design from its high-output diesel engines, and has successfully applied this technology to the K-series V-6 valve gear.

Cylinder head covers are made of aluminium and have steel oil separators to separate the oil from the blowby gases within the cover. To reduce noise and vibration, the covers feature full floating mounting to the cylinder head via rubber gaskets.

The cast iron camshafts are hollow to reduce weight. They actuate valves via inverted bucket tappets with integral maintenance-free hydraulic lash adjusters

(HLA).

The two-stage camshaft drive allowed the adoption of a very narrow angle between the Vee-inclined valves, an inc1uded angle of 27 degrees, forming a compact, pentroof-shaped combustion chamber shape. The compact nature of the primary belt drive also allowed the designers to reduce the height of the front of the engine. Valve diameters are 28.5 mm for intakes and 23.1 mm for exhausts: valve lifts are 7.8 mm and 8.4 mm, respectively. The combustion chamber is a pent-roof type with a large squish area, the latter pushing mixtures toward the center of the chamber where the spark plug is located, and thus aiding in more complete combustion.

Cooling and Lubrication

The lubricating system is a full-flow, force-fed type pressurized by a trochoid-gear oil pump mounted on the front of the engine block and driven by the crankshaft. An oil cooler is used to reduce engine oil temperature. It is water cooled and fits between the oil filter and the oil filter body. Oil jet valves are used in the crankshaft main bearing support to cool the pistons. The oil jet valve sprays oil against the underside of the piston when the oil pressure reaches 245 kPa (36 psi).

The cooling system adopts a belt-driven centrifugal pump, an electric cooling fan and a cross- flow aluminium radiator with plastic end tanks. The radiator is low in height and light in weight, and has ample heat dissipating capacity under the most arduous climatic and driving conditions

Fuel Injection

The new fuel injection is the latest digital-electronically managed, L-Jetronic, multi-point, port injection system. A central 8-bit microprocessor controls the variable induction system, ignition and onboard diagnostic functions in addition to the fuel infection system.

The injection system features twin-nozzle, side-feeding injector units with built-in fuel-volume control. The fuel-volume control device is located within the injector unit itself. Reliability is greatly enhanced, assuring a sensitive response to every

throttle movement.

Two such units are used, one for each bank of three cylinders. Each unit integrates three injectors, each of which is fed fuel from its side, rather than from the top as with a conventional injector. Because of this design, fuel vapor generated by engine heat is easily carried away by the return fuel which facilitates quick, stable restarting after high-speed and high-load operation.

The integrated metering-injector assembly is light and compact and emits less noise, the last an important consideration because of all the work that has gone into reducing mechanical noise from the V-6.

The use of integrated harness wires (individual wiring to each cylinder is integrated in the injector unit) together with side-feed injectors is a technology unique to Mazda.

Induction

Fuel is injected sequentially to the individual intake ports through the twin-stream injector nozzles, allowing finer mixture control and precise injection direction and timing, which improves performance, responsiveness and fuel efficiency.

Air flow in the induction system is measured by Mazda's "Linearic" air-flow meter, in place of a conventional vane-type device. Made largely of precision-formed, lightweight plastic, the cylindrical unit is about half the weight of a metal air-flow meter and is much more compact in size. It employs a sliding measuring cone whose displacement by incoming air is translated as air flow volume.

Volumetric efficiency of the 2.0-litre V-6 is greatly enhanced by the application of Mazda technology to two natural supercharging phenomena:
Inertia Charge Effect-Air within the induction tract is accelerated by movement of the piston during the first half of the intake stroke and then pushed into the cylinder by its own inertia in the last half of the intake stroke.

The column of air in the intake manifold may be likened to a weight-mass, and the air within the cylinder as a spring. Piston movement induces a weight-mass resonance, whose frequency can be optimized to help push air into the cylinder. And the length of the induction tracts can be calculated to

maximize the filling of the cylinder by this Inertia Charge Effect.

Resonance Charge Effect- This phenomenon is unique to a 6-cylinder layout, wherein air column vibrations produce a supercharging effect. The weight-mass/spring equation also applies to this charge effect. In this case the air column within the resonance tube is the weight-mass and the air in the plenum chamber is the spring.

Mazda exploits these two effects with a technology it calls VRIS, Variable Resonance Induction System, which has progressed to a new level of refinement in the Type-K engine. Resonance and inertia supercharge effects are fully exploited in four rpm zones, instead of the original VRIS' s two zones, to optimize the engine's torque characteristics

The V-6's induction system consists of two separate plenum chambers which also act as resonance tubes. Each chamber feeds air through individually tuned tracts to one bank of cylinders. Each of these chambers is split in two and connected by an intricately shaped resonance tube which is fitted with a butterfly-type switch valve. At the rear of one plenum chamber is another butterfly control valve. The tubes are opened and closed singularly or jointly in four rpm zones, producing variations of resonance tube length. The engine's torque curve "rides" on the best values produced by three different torque characteristics obtained by the various resonance tube lengths.

The engine's idle-speed control (ISC) system regulates the amount of bypass air passing through the throttle body to improve starting, reduce warm-up times, improve idle stability and provide better driveability

Exhaust

Exhaust gas is collected from each of the three-into-one cast iron manifolds and routed into the semi-dual exhaust system. Dual equal-length tubes, whose lengths were calculated to improve mid-range torque characteristics, collect into the single downstream system at the entry of a pre-silencer. From there, exhaust gases are led to a large-volume main silence and let out through twin, styled tail pipes.

A 3-way catalytic converter is used to reduce CO, HC and NOx emissions.

Engine Management System

A K-series engine is intelligent-the integrated engine management system incorporates a microprocessor to precisely control a number of key functions, ranging from fuel injection and ignition timing to valve operation and emissions. It sensitively controls the engine to optimize performance and performs diagnoses, making adjustments as necessary. So the engine always runs under optimum conditions, while maximizing fuel economy and minimizing emission levels.

Ignition System

The electronically controlled ignition system incorporates two important features. One is the trace knock control, whereby ignition timing is set extremely dose to the engine's knock boundary. When the system senses minute knocking, imperceptible to human ears, it promptly adjusts ignition timing to control further knocking.

Operating on this hairline knock limit, the engine's performance is optimized with no detrimental impact on its mechanical reliability.

The other feature is the active ignition control function employed when the V-6 is combined with the manual transmission. Torque fluctuations during acceleration may cause unpleasant bucking vibrations. The ignition system senses variation in engine rpm, interprets it as the vehicle's forward-motion variation and slightly retards ignition timing to subtly suppress torque output in order to ensure the vehicle's smooth progress.

With automatie transmission, the engine and transmission computers are interfaced ("talk to each other") so that the former momentarily retards ignition timing in order to moderate the engine's torque output for smoother gear changes.

The Type-B6D, 1.6i, DOHC, Inline 4-Cylinder Engine

The 1.6i, DOHC, inline 4-cylinder was selected for the base Xedos 6 model. It was specifically tuned to deliver a fine balance of refinement and performance. This engine is highly efficient, producing a high output of 114 ps. Emphasis was placed on reducing NVH characteristics. The adoption of a flexible flywheel is a good example

of a step taken to reduce noise, vibration and harshness. Another is the use of a forged crankshaft.

The 1,598-cc engine has a bore and stroke of 78.0 mm by 83.6 mm, respectively. It produces 114 ps (DIN) at 6,500 rpm and maximum torque of 139 Nm (DIN) at 4,600 rpm with a 9.4: 1 compression ratio and running on 95 octane (RON) unleaded gasoline.

Cylinder Block Design

The 1.6i 4-cylinder engine features a short-skirt cast iron cylinder block reinforced by a Main Bearing Support Plate (MBSP). This intricately shaped steel plate serves a dual function: it supports the lower main bearing caps and also stiffens the block, effectively reducing torsional and bending vibrations that occur in the medium frequency range.

Mazda engineers went to great lengths to increase the rigidity of the cylinder block to reduce engine vibration. These include widening the stiffening ribs in the cylinder block, increasing the thickness of the oil pan rail and reinforcing existing ribs and adding extra ribs around the crankshaft journals.

A cast aluminium oil pan that bolts directly to the transaxle is used to reduce engine noise and power train vibration and noise.

The high-rigidity forged steel crankshaft is fully balanced with eight counter weights and is supported by five main bearings. It is fitted with an accessory drive pulley that incorporates adamper to reduce crankshaft torsional vibration. The fillet area of the crankpin journals and main journals is rolled for increased crankshaft strength. Also, the crankshaft is cross-drilled to provide better lubrication.

The aluminium alloy pistons feature a recessed dome and recesses for valve clearance. Oil scraped off the cylinder wall by the oil ring returns to the oil pan from the space around the ends of the piston pin rather than through slots in the piston. This design prevents oil spray from the piston cooling jets from working up into the combustion chamber.

The connecting rods are a lightweight design to improve engine response. For improved durability under continuous high-speed, high-load driving conditions a full

floating piston pin is used. In addition, the large end of the connecting rod is grooved in the thrust direction. Oil lubricating the journal flows out through this oil channel, thus reducing oil pressure fluctuations and providing improved bearing lubrication.

Cylinder Head Design

The cylinder head is precision-diecast aluminium for light weight and high efficiency. A single-stage cogged belt drives the twin overhead camshafts, operating 4-valves per cylinder, via inverted bucket tappets that incorporate hydraulic lash adjusters. These adjusters maintain precise valve clearances without the need for periodic adjustments. By employing the 4-valve-per-cylinder layout, the total valve is increased, while the weight is reduced, improving the cylinder head intake and exhaust efficiency.

The iron camshafts are hollow-cast to reduce weight. Each camshaft is 500 grams lighter than a comparable solid camshaft. To improve reliability, oil grooves are cut into the journals of the exhaust camshaft. Camshaft pulleys are made of sintered alloy and are a cogged type to reduce noise.

The valves are Vee-inclined at an included angle of 50 degrees in a compact, pent-roof shaped combustion chamber with a squish area. Valve diameters are 33 mm for the intakes and 28 mm for the exhausts; valve lifts are 8.0 mm and 8.5 mm respectively.

The spark plugs are centrally located in the combustion chamber, aiding in more complete combustion, lower emissions and higher fuel
Economy.

Flexible Flywheel

The flexible flywheel fitted to the 1.6i engine by Mazda's engineers structurally absorbs torque changes of the engine and prevents crankshaft bending vibrations from being transmitted to the flywheel mass by flexibly supporting the flywheel mass through the drive plate. As a result, engine and clutch pedal vibrations are reduced.

Cooling and Lubrication

The lubrication system employs a high-efficiency, trochoid-gear-type pump driven directly by the crankshaft. Oil from the pump passes through the oil filter and is sent to the main galley, after which it is distributed to the various parts of the engine. Piston cooling jets in the cylinder block help cool the pistons to improve high-speed, high-load durability.

The cooling system adopts a belt-driven centrifugal pump, an electric cooling fan and a cross- flow aluminium radiator. This compact, lightweight radiator provides ample engine cooling under the most strenuous driving and climatic conditions.

Fuel Injection

Individual port injectors in the electronically controlled fuel injection system are positioned close to the entrance of the combustion chamber in the cylinder head. They inject directly into the intake ports, thus enhancing the engine's throttle response

Based on the latest digital-electronically managed L-Jetronic, multi-point design, the system supplies fuel in two groups of cylinders, cylinders one and three together and two and four together in sequence. A central 8-bit microprocessor controls the fuel injection system in addition to its ignition and onboard diagnostic functions.

Induction

Air flow in the induction system is measured by Mazda's "Linearic" air-flow meter, in place of a conventional vane-type device. Made largely of precision-formed, lightweight plastic, the cylindrical unit is about half the weight of a metal air-flow meter and is much more compact in size. It employs a sliding measuring cone whose displacement by incoming air is translated as air flow volume.

The 1.6i' s induction system employs Mazda's Variable Inertia Charging System (VICS) that varies the effective length of the intake tract in order to optimize cylinder filling. Each cylinder's intake tract is split into two passages at the manifold's entry, one branch being fitted with a butterfly valve. This valve is closed by engine vacuum below 5,500 rpm, in effect "lengthening" the tract to fully exploit the incoming air's ram inertia effect. Above 5,500 rpm, the butterfly valve opens, in essence

"shortening" the tract to admit the additional air needed for high-power operation.

Exhaust

The twincam 1.6i's exhaust system includes a pre-silencer and a large-volume main silencer that not only produces a subdued yet sporty sound, but also minimizes exhaust gas pressure. A 3-way catalytic converter and an oxygen sensor are part of the system.

Engine Management System

The 1.6i's integrated engine management system incorporates a microprocessor to precisely control a number of key functions, ranging from fuel injection and ignition timing to valve operation and emissions. It sensitively controls the engine to optimize performance and performs diagnostics, making adjustments as necessary. So the engine always runs under optimum conditions, while maximizing fuel economy and minimizing emission levels

Ignition System

The ignition system is electronically controlled with an ECU (electronic control unit) determining optimum ignition timing by signals collected from the distributor, the air flow meter and coolant temperature and throttle sensors.

When the engine block vibrates, a knock sensor generates a small voltage signal that is sent to the ECU. The ECU then determines if the signal is a "knock" signal. If it is, the ignition timing is retarded a maximum of 7 degrees depending upon the intensity of the knock. This system is in effect when engine revs are between 1,000 and 7,000 rpm and the coolant temperature is above 80 degrees C.

Performance and Fuel Consumption

The following charts list the performance and the fuel consumption of the various Xedos 6 models:

PERFORMANCE-Acceleration (sec) and Maximum Speed (km/h)

	1.6i MT	1.6i AT	2.0 V-6 MT	2.0 V-6 AT
0-100 km/h	10.3	13.7	9.3	12.0
60-100 km/h: (4^{th})	12.5	-	10.6	-
(Drive)	-	7.5	-	6.8
80-120 km/h: (5^{th})	19.3	-	15.1	-
(Drive)	-	10.6	-	8.9
Maximum speed, km/h	200	173	216 (214)	203 (201)

( ): Without spoiler

FUEL CONSUMPTION, Litres/100 kilometers

	1.6i MT	1.6i AT	2.0 V-6 MT	2.0 V-6 AT
90 km/h	5.5	5.8	6.3	6.5
120 km/h	7.1	7.3	7.6	8.1
160 km/h	10.4	12.0	11.1	12.5
180 km/h	13.3	12.2	13.2	15.6
ECE	10.0	10.7	10.7	11.8

DRIVETRAIN

The Xedos 6 is offered with either a 5-speed manual transaxle or a newly developed electronically controlled 4-speed automatic transmission. Drive is to the front wheels via equal-length drive shafts which minimize torque steer effects during rapid low-gear acceleration and when cornering.

The Type-F25M-R and G25M-R 5-Speed Manual Transaxles

The 1.6i engine uses the F2-type manual while the V-6 is fitted with the G2-type. Both feature a gear assembly that carries its 3rd- 4th- and 5th-gear synchronizers on the primary shaft. These gears, except for the one that is engaged, "free-wheel" on the shaft, greatly reducing the primary shaft's moment of inertia and thus enabling quicker and lighter gear changes. This arrangement also eliminates the datter of gears when the car is standing still because the secondary shaft doesn't revolve. The primary shaft is supported by ball bearings that have low rolling resistance, again contributing to smoother gear changes.

For the G2 gearbox, the gear-tooth shape was optimized by Mazda's latest computer analysis method called Load Teeth Contact Analysis (LTCA), which results in greatly reduced meshing noise. The analysis has been applied to all forward and final-drive gears. In addition, the final-drive gear has wider teeth (25 mm vs the 22 mm teeth used previously), improving the meshing ratio by 13 percent and reducing gear noise emission from this source.

Synchronizer action has been enhanced by a new shift fork design in which the two arms of all the shift forks have equal rigidity. This means that the displacements of the two arms are always the same. This allows the hub sleeve to move parallel and to engage with the gear more easily.

The gear selector's movement has been reduced to optimize the ratio between selection movement and shift movement, making for quicker ehanges. In addition, five Teflon bushings support the shift rods, reducing friction by as much as 15 percent as compared with the original type-G transaxle.

The Type-G4E Electronically Controlled 4-Speed Automatic

The new electronically controlled 4-speed automatic has vastly improved gear changes-smoother and more responsive- is lighter by 5 kg than the previous automatic and is also more fuel efficient. The transmission's torque converter lockup and gear changes are controlled both by the dedicated electronic automatic transmission control unit (ATCU) and hydraulic pressure regulated by duty and shift solenoids.

The ATCU and the engine ECD interact to improve shift quality by momentarily reducing the engine's torque output by a combination of fuel injeetion cut-off to three of the six cylinders and ignition retard. Torque reduction occurs during upshifts and downshifts.

The automatic operates in two modes, Normal and Sport, which are automatically selected according to how far and how fast the accelerator pedal is depressed. The Hold mode allows the driver to select and hold any of the lower three gears by depressing a small push button located on the selector knob and moving the shift lever. The Hold mode includes a safeguard feature in which the transmission automatically downshifts from 3rd to 2nd even when the lever is in "D" (3rd gear in Hold mode) to ensure adequate acceleration from standstill. The Hold mode not only gives the sporty feel of a manual gearbox, but also offers better contral on wet or snow-covered surfaces for safety.

A new compact, lightweight, high-efficiency torque converter is mated to the transaxle. With the V-6 engine the converter incorporates new computer-aided designs for the impeller, stator and turbine vanes, which reflect Mazda's latest thinking on vane shapes and flow dynamics. The new converter, while similar in size to the previous unit, combines higher torque capacity and enhanced transmission efficiency.

In 4th gear torque converter lockup the engine and transmission are directly connected, improving the drivetrain's efficiency and improving fuel economy. In addition, the torque converter incorporates a "slip lockup" function. This feature acts much like a driver slipping the clutch at low vehicle speeds in a car equipped with a manual gearbox to preclude transmission of unpleasant noise and vibrations. This

feature retains most of the direct-drive efficiency derived from torque converter lockup, yet smooths the flow of power at low vehicle speeds.

The automatic transaxle is equipped with an air-cooled oil cooler, in addition to a water-cooled oil cooler (inside the radiator), for improved transmission cooling performance.

Gear Ratios

	V-6 5M	V-6 4EAT	4-Cyl 5M	4-Cyl4EAT
1st	3.307	2.800	3.416	2.800
2nd	1.833	1.540	1.842	1.540
3rd	1.233	1.000	1.290	1. 000
4th	0.914	0.700	0.918	0.700
5th	0.755	-	0.731	-
Reverse	3.166	2.333	3.214	2.333
Final Drive Ratio	4.388	4.157	4.388	4.058

Drive Shafts and Wheel Axles

Drive shafts are of the same diameter and equal length with a central support bearing. The shafts incorporate angular-contact, tripod, constant-velocity joints. Each wheel axle is supported by angular ball bearings with lower rotational resistance.

Power Train Mounting

The power train is mounted at five points whose positions were chosen only after careful analysis: aft and mid-height of the clutch/torque converter housing (No. 1 mount); at the lower front of the clutch/torque converter housing (No. 2); the engine's right end (No. 3); above the transaxle's left end (No. 4); and a roll-arrester block (No. 5), under the transaxle.

A steel fabricated longitudinal frame supports the No. 2 and No. 3 mounts. The rear of this frame is rigidly bolted to the cross member carrying the front suspension, forming an inverted T -shaped sub frame structure. The front end of the longitudinal member is rubber mounted to the body shell's foremost cross member. The axis line of the Nos. 1 and 2 mounts crosses the power train's torque roll axis almost at right angles, and is placed as close as possible to the axis of the power train's center of gravity. This mounting method markedly reduces the power train's pitching motion

and yawing moment due to torque fluctuations and minimizes idling noise and vibration.

Mounts Nos. 1 and 3 are fluid-filled rubber mounts that absorb power train vibrations by damping action, allowing the adoption of lower-rate bushings that minimize transmission of high frequency vibrations into the passenger compartment.

CHASSIS

Foremost in the minds of Mazda's designers and engineers as they developed the Xedos 6' s chassis was to ensure that driving the Xedos 6 would be a deeply satisfying experience. The car would have to have confidence-inspiring handling characteristics and a sporty yet refined ride. Impeccable driving stability for relaxed long-distance, high-speed cruising was also of primary importance. An overall balance of ride, handling, steering and braking-to the highest order-would have to be achieved if the Xedos 6 was to appeal to today's sophisticated and discriminating European drivers.

Eventually, they decided on MacPherson struts with lower transverse A-arms up front and a revised and refined version of Mazda' s proven TTL (Twin Trapezoidal Link) suspension at the rear.

Front Suspension

The independent front suspension features lightweight and space efficient MacPherson struts. Each strut is located by a lower, pressed-steel, transverse A-arm that actually looks more like a letter "L." These arms have a wide-mount base with a front, rubber bushing, mounting point in line with the wheel axis. The front bushing has a metal collar inserted and bonded within the rubber body, giving it high lateral rigidity. The A-arms' rear bushings are liquid-filled. Together, these bushings provide ample fore-and-aft compliance while assuring high lateral rigidity, and they also eliminate unwanted compliance steer.

The lower A-arm mount pivots are carried on a sturdy, steel, fabricated, closed-section subframe to which the steering gear assembly is also attached. The cross member forms a T -shaped structure with the longitudinal frame that carries the power train. This member is further reinforced by a sheet-steel transverse member that connects the A-arm mount bases. The cross member structure greatly adds to the suspension assembly's lateral rigidity, an essential ingredient for precise handling and secure road holding.

An important feature adopted for the Xedos 6 to achieve a bump stroke of 85 mm

is a high-stress coil spring. Rebound travel is 100 mm. A lower front fender line is made possible by increasing the inclination of the dampers: kingpin inclination is an acute 14 degrees 30 minutes (unladen). This in turn makes it possible to ensure that camber changes caused by bumps and steering angle offset each other.

Accordingly the negative camber engineered into the front suspension geometry provides plenty of front-end grip, and cancels the understeer experienced by most front-wheel-drive vehicles during hard cornering. The payoff is vice-free response when approaching the limit with just a trace of understeer.

The strut-damper and coil spring are offset-located on separate top mount seats. This reduces the side force applied to the shock absorber piston rod which minimizes sliding friction. This smooth shock absorber action and contributes to ride comfort. The top of the strut incorporates a urethane bump stop to reduce uncomfortable shock.

Furthermore, to achieve a refined ride and the NVH targets, all suspension bushings are designed to isolate vibrations and minimize resonance. The adoption of a strut tower bar (standard for the 2.0-litre models), which is usually reserved for sports cars, specialty cars and rally cars, provides greater suspension rigidity. Taken together, these enhancements deliver outstanding straight-line stability and ride comfort, along with safe, predictable handling.

A tubular anti-roll bar with an outer diameter of 22.2 mm is standard and is mounted to the A-arm via ball-jointed links which enable the bar to quickly react to the smallest difference between left and right wheel movements.

The front suspension geometry incorporates a negative camber angle of 15 minutes (unladen) for improved grip, an acute caster angle of 2 degrees 30 minutes (unladen) and about 19 mm of trail for straight-line stability

Rear Suspension

The Xedos 6 rear suspension incorporates Mazda's latest refinements to its TTL suspension design.

TTL refers to Twin Trapezoidal Link, Mazda's shorthand way of describing its proven rear suspension design which features strut-damper units located by twin-

transverse links forming a trapezoid. In addition, a single tubular trailing link on each side provides fore/aft location and control.

For the Xedos 6 application, the transverse links are lengthened to the maximum allowed by the wide rear track and the pickup location on the subframe. The links are also unequal in length, ensuring linear toe-change characteristics in rebound. The front link measures 550 mm and the rear one 580 mm; their inner pivots are widely spaced at 172 mm. Further, the twin links have been moved rearward in relation to the wheel axis by 40 mm as compared with current TTL suspensions, optimizing desirable toe change when lateral (cornering) force is applied.

Besides those attributes previously described, the Xedos 6's TTL features a significant reduction in the change in roll center height for a given amount of jounce travel, 80 mm for every 50 mm of travel compared with 138 mm for current TTL designs. All of these tuning changes combine to provide the Xedos 6 with impressive straight-line stability, nimble but exact lane changes, confidence-inspiring handling at all speeds on any road surface and a supple ride.

A vital role in the Xedos 6' s stable handling characteristics is provided by its mounting bushings. The front lateral link bushings are compliant inward and stiff outward. Conversely, the rear lateral link bushings are stiff inward and compliant outward. Because of the asymmetrical characteristics, the rear wheel assumes an almost neutral toe attitude when lateral force is moderate, aiding the car's "turn-in" ability. When a larger cornering force is applied to the wheel, the front bushing "gives in" while the rear one resists, thus inducing a toe-in attitude that improves the car's cornering stability. These bushings also provide stabilization when braking forces are applied to the rear wheels.

Much like the front strut-damper, the rear unit and its coil spiring are offset mounted on separate seats and the strut incorporates a urethane bump stopper.

A l2-mm diameter, ball-joint-mounted, solid anti-roll bar is standard on all models. A rear strut tower bar (standard for the 2.0-litre models), connects the tops of the two strut-damper units for increased suspension rigidity.

The rear suspension has 90 mm of jounce travel and 120 mm in rebound; rear camber is a negative 45 minutes (unladen).

Steering

The Xedos 6 is equipped with rack-and-pinion steering with engine-rpm-sensing power assistance. Overall ratio is a quick 17.8: 1; 3.1 turns of the steering wheel from lock to lock and a kerb-to-kerb turning circ1e of a tight 10.4 m

The layout of the steering linkage is optimized by reducing the swept angle of the tie rods. The rigidity of the cross member and the body to which the steering is attached is increased. That results in smooth handling along with areduction in unpleasant shocks, such as kick-back, generated by the road surface.

The steering column incorporates a telescoping seetion which progressively collapses in a frontal collision.

Brakes

The Xedos 6 has a 4-wheel-disc braking system featuring brake pads, which use aramid materials.

The ventilated front rotors are 258 mm in diameter and 24 mm thick; rear rotors are solid and are 261 mm in diameter and 10 mm thick. The 1.6-litre model with 5-speed manual features a single 9 in. vacuum servo unit in a common housing. Both V -6 models, as weIl as the 4-cylinder with automatie, have a tandem 7- and 8-in. vacuum servo unit.

An anti-lock braking system (ABS) is offered on all models. The system consists of an electronic control unit, four wheel sensors and a new compact actuator. Most anti-lock systems operate by controlling the brake fluid. However, Mazda' s ABS has a clever flow control valve to prevent wheellock-up by adjusting pressure modulation. The new hydraulic actuator is much lighter and more compact (about half the size of the one used for the previous Mazda 626), making for easier installation in today' s crowded engine compartments.

Each of the four wheel sensors individually monitors one wheel. The front brakes are regulated individually and the rears are controlled as a pair. Thus the designation, "4-wheel sensor, 3-control channel ABS."

Wheels and Tyres

To decrease unsprung mass for improvements in ride and handling, and to emphasize the upscale image of the Xedos 6, aluminium alloy wheels are fitted (optional with the 1.6-litre without sunroof). Wheels for V-6 models are 15 X 6JJ; those for the 4-cy linder models are 14 X 5.5JJ.

Tyre sizes correspond to the engine power and suspension setups of each car. The 1.6i is shod with 185/65R-14 tyres while 195/60R-15s are fitted to the more powerful 2.0i V -6. Both give a smooth ride balanced by high grip and precise, linear handling characteristics.

BODY

Structural rigidity is important for securing good handling, safety and ride comfort. However, body rigidity alone is not enough. It is essential to match body rigidity with the suspension set-up if comfortable ride characteristics are to be achieved. Various combinations of suspension geometry and body rigidity were evaluated to determine the ideal balance for the Xedos 6. The results are good handling, stability and ride comfort within the compact dimensions laid down for the Xedos 6.

The Xedos 6 is of unit-body construction meaning the body and the frame are one, not separate elements. It is an all-steel, welded structure. Mazda's development objective was to create a body shell of exceptional rigidity, surpassing the company's already well recognized achievements in this area.

The rigid body provides a firm base of support which allows the various mechanical components of the vehicle, the drive train and the chassis, to function more efficiently.

Suppression of noise, vibration and harshness were among the priority development objectives for the Xedos 6 body. New body construction techniques and novel new materials greatly contributed to achieving the projected goals.

Occupant protection in a collision was of utmost concern to Mazda's design and development team. By using advanced computer-aided crash analysis techniques, Mazda was able to maximize the body's crashworthiness; the structure absorbs impact in front and rear "crumple" zones and surrounds the occupants with a rigid cabin.

Body Structure

To achieve their goals in the areas of safety and rigidity, Mazda body designers knew that the main longitudinal frame members must run as straight as possible and be of ample cross section. In addition, their attachments to other structural members would have to be strengthened. In the Xedos 6 the longitudinals running from the first to the second cross members under the passenger compartment are straight and they have large closed box sections. Likewise, the side sills are of large cross section, yet

they are low enough that they don't interfere with easy entry to and exit from the cabin. Each front frame member and side sill is securely connected by a large torque box. The floor section aft of the second cross member has heavy, longitudinal ribbing and this area is further reinforced by the central tunnel.

The upper body structure features heavily reinforced A- and B-pillars of dual box-section design. The A-pillar is particularly important to the structural integrity of a front-wheel-drive automobile.

The Xedos 6' s A-pillars feature internal reinforcements running the length of the A-pillars, and are also rigidly attached to the roof structure.

Secure attachment of the steering column is critical in suppressing noise and vibration. A straight steering column support member runs wall-to-wall across the cockpit, contributing to enhanced rigidity and safety.

The C-pillar attachment to the package tray upper member was also reinforced.

For increased protection in a rear collision, the rear side frame was reinforced to protect the fuel tank and fuel inlet pipe. Also, the rear side frame kick-up section was strengthened to absorb impacts and reduce shock to the passenger compartment.

Particular attention was paid to weight reduction combined with strength. High-tensile steel accounts for about 30 percent of the Xedos 6's total steel sheet weight.

Body Technology

Mazda employs several advanced fabrication techniques during body manufacture that contribute to improving the strength and the appearance of welded parts. For instance, new welders control weld time and weld pressure according to the material and the thickness of the steel sheets, as well as combinations of steels. Management of amperage control has been increased from five steps to 10. And automatie tip cutters are adopted for all welders.

Extensive NVH Control Measures

Novel new materials were developed jointed by Mazda and its suppliers for noise and vibration suppression. A new sandwich-type sound-deadening material is applied to the front bulkhead and the rear inner wheel arches. This material performs better

than a laminated steel or a conventional damping-material-over-steel panel. The new material has sound damping material sandwiched between a matching-size steel sheet and the main steel panel, and the two steel sheets are mated by spot welding.

All pillars are filled with urethane foam. During body assembly a urethane sheet is bonded inside each pillar. When the body heats up in the paint oven, the urethane expands, filling the pillars. This foam eliminates the noise that would normally resonate from a hollow structure.

A new sound-damping material is applied to the cabin floor. This material possesses consistent damping characteristics over a wide temperature range.

Also, a thicker layer of undercoating is applied to the rear wheel housings to minimize noise transmission from gravel and sand thrown up by the tyres.

To suppress road noise, Mazda first examined the tyres to make sure they isolated disturbing road inputs. In addition, the engineers studied the resonance frequencies of the various suspension components induding the bushings.

The Xedos 6 is at the top of its class for reducing wind noise. A new type of inner sash with a garnish to keep the glass in place and the triple sealing structure of the body and sash sealing, suppress resonance generated by air rushing over and through the body when the car is travelling at high speeds.

Reducing the gap between the glass and its moulding to just 3.5 mm by the use of a buttonless inner sash also helps cut wind noise as well as improve appearance.

When the sliding sunroof is tilted up, a deflector helps reduce wind turbulence and resonance into the cabin.

Annoying low frequency hammering was also decreased by the rigidity-decreasing and noise-isolation measures previously detailed.

Attention to detail can be found in the new quiet wiper motor and the innovative rubber-mounted motor for the sliding roof.

Inside the cockpit, a cable-less speedometer was adopted to avoid cable noise and to improve durability and reliability.

To eliminate resonance when the engine is idling, brackets and braces for mounting engine auxiliaries have been reinforced. Fluid-filled engine mounts absorb engine vibrations during accelerations and deceleration.

To insulate noise from the engine compartment, the inner surface of the bonnet lid is lined with insulating material. In addition, Teflon bushings at the bonnet hinges reduce sliding friction as well as noise caused by wear.

Anti-Corrosion Measures

Galvanized steel sheet is used for about 90 percent of the body sheet metal. Organic-resin coated steel panels are used for the exterior and underside of the car. Use of this organic-resin clear paint over the zinc-nickel plated steel sheet greatly enhances corrosion resistance.

Three kilograms of PVC (polyvinyl chloride) undercoat are applied over the entire underbody of the car. In addition, all hollow sections, including the doors, lids, frames, cowl, and side sill cavities are coated with anti-rust wax, while the underbody's panel joints are coated with a sealing material.

There's also a 100-micron urethane coating on the lower portions of the doors and a 400-micron PVC coating on the lower portions of the side sills to prevent chipping. Thus the body is guaranteed for 8 years against perforations caused by rust.

Paint: A Jewel-Like Finish

A brilliant mirror-like finish with no ripples that will look showroom new forever is the goal of every automotive paint engineer.

With the new technologies and painting processes introduced by Mazda with the Xedos 6, Mazda's engineers have come closer to realizing this dream than any other car company.

A quality finish has to start with a quality surface. The Xedos 6's body panels are formed from a new type of steel which has microscopic recesses etched into the surface by a laser to improve paint adhesion.

Following a cathodic electro-coating primer bath and applications of various sealers and PVC undercoats, the body moves to an area where an elastic soft primer is coated on the bonnet, front fender and front portion of the roof, which are vulnerable to stone chip damage. Urethane paint is applied to the lower sides of the door, again

to improve resistance to chipping. Robots are used to improve and stabilize coating quality.

Next, a mid-coat of a colour similar to the top coat is applied. This produces a lustrous finish and makes damage to the top coat caused by flying road chips barely perceptible. The insides of the boot and engine compartment are carefully coated, with great attention given to assuring uniform appearance.

The top coat consists of a base coat and a clear coat. Normally, two coats of each are applied. However, Mazda has adopted a centrifugal spraying system using a high-speed rotation tip with excellent paint atomizing properties instead of a compressed air spray nozzle system. As a result, the paint can be applied more finely and therefore three thinner base coats followed by three clear coats are applied. This has the advantage of allowing the mica particles in the metallic colours to spread out more evenly so that light reflection is more directional, resulting in more vivid colours and a more brilliant shine.

Regardless of whether the base coat is a metallic and solid colour, clear coats are applied. Finally the top coat is hardened by a 2-stage pre-baking system to further improve appearance and prevent dust adhesion.

The paint itself was specially developed for the Xedos 6 to give a hard, scratch-resistant finish and improved acid resistance. With this protection, the Xedos 6 still looks like new long after leaving the showroom.

The *piece de resistance* of the Xedos 6' s painting process is Mazda's rotation baking, which gives the Xedos 6 its "Hi-reflex" finish. The car body is rotated on its longitudinal axis while the clear coat is baked. Rotating the body approximately every 10 seconds while the paint bakes and eures negates the effects of gravity on the paint. Application of this technology has allowed Mazda to ac hieve a quantum leap forward in surface smoothness and brilliance.

Reducing Gaps

Advanced production technology has allowed Mazda to make considerable gains in the area of panel fit. For instance, the gaps between doors, fenders, bonnet and boot are 15-30 percent less than those of some Mazda models. This creates a smooth, non-

broken external appearance and contributes to wind noise reduction.

Achieving such fine tolerances would not have been possible without the use of new Cray supercomputers. By capitalizing on the speed of the Cray supercomputer, the number of points the designers used for FEM analysis of the Xedos 6's body was tripled. The result was not only a sharp rise in the strength and the rigidity of body components, but also the ability to closely monitor the gaps between panels from the initial design stage.

One of the most important prerequisites for the introduction of a new upmarket car line is industry-leading quality, which can only be realized with a state-of-the-art production facility. ,Mazda made this commitment by constructing a new production facility at its plant in Hofu, featuring the latest in advanced automation systems and technologies, including extensive use of automatie inline measurement devices to feed back information on manufacturing errors in real-time, thus improving the precision of the car, especially with regard to panel fit.

A new 5,200-ton press is one of the largest in Japan. It stamps out one-piece outer side frames, forming a beautiful, high-quality body that faithfully reflects the designers' initial intentions.

In addition, the conventional 3-step assembly process for the body-in-white was reduced to one step, and assembly of the doors, bonnet, boot lid and nose cap were fully automated for quality improvement

SAFETY

Higher Quality Equals a Safer Car

Quality in all its permutations must ultimately connect with safety. Mazda has included a wide array of active and passive safety measures in the design of the Xedos 6.

Active Safety

The driver must have total control of the car if there is to be a chance of avoiding an accident. These aspects of active safety have already been detailed in the CHASSIS section. But in addition to basic handling, ride, steering, braking and engine performance, Mazda designers and engineers placed special emphasis on ensuring a good field of vision through the adoption of a low bonnet and by keeping windows and mirrors clear. Steps taken include:

- Demisting heating coils built into the asymmetric door mirrors
- Rain gutters integrated into the A-pillars and at the trailing edge of the roof
- Projector-type fog lamps can be mounted optionally in the integrated front bumper and air dam skirt
- Wiper blades held against the windscreen by air pressure generated at the twisted head and fin when the car is travelling at high speeds
- A headlamp cleaner system is optional for improved safety. The system shares its washer fluid reservoir with the windshield washer, but each system has its own motor.

Active safety also includes a legible speedometer and easily operable switches and controls, together with well thought-out instrument panel illumination to minimize distractions. At night, the halogen projector-beam head lamps keep the road ahead welllit. At the rear, the lamp cluster is large for improved visibility.

Passive Safety

Many of the steps Mazda has taken to protect Xedos 6 occupants from injury when

an accident is unavoidable have been described in the BODY section. These include such things as front and rear crushable zones, a super-strong cockpit to minimize deformation, reinforced pillars and door latches, an impact absorbing instrument panel and a steering column that progressively collapses in a frontal impact

A driver-side airbag supplemental restraint system (SRS) is offered as an option. In conjunction with 3-point seat belts, it protects the driver' s head and chest area

By providing 5-step, height-adjustable shoulder anchors, and building the lower anchor into the seat, the front 3-point seat belts can be adjusted to give maximum protection to different-size occupants. When not in use, the rear seat belts are housed neatly in the seats.

SPECIFICATIONS

DIMENSIONS			2.0i	1.6i
Overall Length		(mm)	4,560	4,560
Overall Width		(mm)	1,700	1,700
Overall Height		(mm)	1,355	1,345
Wheelbase		(mm)	2,610	2,610
Track	Front	(mm)	1,470	1,480
	Rear	(mm)	1,480	1,490
Ground Clearance	Unladen	(mm)	155	145
	Laden	(mm)	135	125
Max. Eff. Leg Room	Front	(mm)	1,092	
	Rear	(mm)	847	
Headroom	Front	(mm)	975 (without sunroof)	
	Rear	(mm)	932 (without sunroof)	
Shoulder Room	Front	(mm)	1,342	
	Rear	(mm)	1,315	
Acc. Pedal to Rear Hip Point		(mm)	1,741	
Luggage Capacity (VDA)		(litre)	407	

KERB WEIGHTS	2.0i		1.6i	
	M5	4EAT	M5	4EAT
(kg)	1,195	1,230	1,130	1,160

ENGINE		2.0i	1.6i
Type		V-shaped 6-cyl. (DOHC 4 valves)	In-line 4-cyl. (DOHC 4 valves)
Bore × Stroke	(mm)	78.0 × 69.6	78.0 × 83.6
Displacement	(cc)	1,995	1,598
Compression Ratio		9.5:1	9.4:1
Carburetion		EGI	
Fuel Tank Capacity	(litre)	60	55
Fuel Pump		Gear-driven	
Engine Oil Capacity	(litre)	4.9	3.4
Oil Filter		Cartridge-type	
Coolant Capacity	(litre)	7.5	6.0
Ignition System		Electronically-controlled, fully transistorized and contactless system	
Alternator	(V-AH)	12-90	12-70
Starter	(kW)	1.7	0.95
Fuel requirement		Unleaded 95 RON	

ENGINE PERFORMANCE		2.0-litre	1.6-litre
Max. Power	DIN	146 ps (108 kW) /6,000 rpm	114 ps (84 kW) /6,500 rpm
	EEC	144 ps (106 kW) /6,000 rpm	113 ps (83 kW) /6,500 rpm
Max. Torque	DIN	175 Nm/5,000 rpm	139 Nm/4,600 rpm
	EEC	172 Nm/5,000 rpm	137 Nm/4,600 rpm

DRIVETRAIN		2.0i		1.6i	
Transaxle		M5	4EAT	M5	4EAT
Gear Ratio	1st	3.307	2.800	3.416	2.800
	2nd	1.833	1.540	1.842	1.540
	3rd	1.233	1.000	1.290	1.000
	4th	0.914	0.700	0.918	0.700
	5th	0.755	—	0.731	—
	Rev.	3.166	2.333	3.214	2.333
Final Gear Ratio		4.388	4.157	4.833	4.058

CLUTCH				
Type			Single dry plate	
Disc Diameter	Outer	(mm)	215	190
	Inner	(mm)	150	130

STEERING					
Type			Rack & pinion		
Power assist			Engine-speed-sensing type		
Gear Ratio			17.8:1		
Turns, Lock-to-Lock			3.1		
Min. Turning Circle, Tyre Center		(m)	10.4		

BRAKES					
Type	Front		Ventilated disk		
	Rear		Solid disk		
Diameter	Front	(mm)	258		
	Rear	(mm)	261		
Diameter, Effective	Front	(mm)	206		
	Rear	(mm)	223		
Swept Area/Wheel	Front	(cm^2)	570		
	Rear	(cm^2)	504		
Vacuum Booster, Diameter		(inch)	7+8	9	7+8
Parking Brake			Mechanical on rear wheels		

CHASSIS			2.0i	1.6i
Body and Chassis Frame			monocoque	
Suspension Type	Front		Independent by MacPherson Struts with coil spring	
	Rear		Independent, strut with coil spring	
Shock Absorber	Front		Cylindrical double-acting type	
	Rear			
Stabilizer Type	Front		Torsion bar	
	Rear			
Stabilizer Diameter	Front	(mm)	22.2	
	Rear	(mm)	12.0	

TYRES & WHEELS	2.0i	1.6i
Tyres	195/60R-15 87V	185/65R-14 85H
Wheels	6JJ × 15	5.5JJ × 14