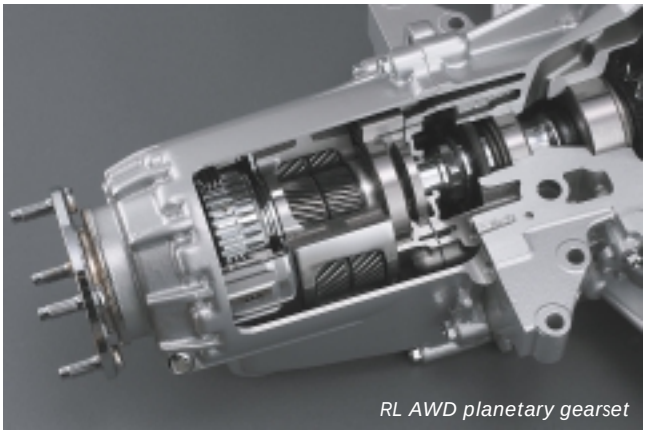
Highlights from New York

The 2004 New York International Auto Show saw the most world debuts in the event's history, with strong themes in new midsize luxury cars and midsize SUVs. The new Acura RL, Cadillac STS, and Infiniti M45 debuted carrying an array of new technologies. Real-time traffic information for the navigation systems is supplied by XM Satellite Radio for the Acura and Cadillac, and the Cadillac and Infiniti both carry a new Bose DVD-audio 5.1 channel surround-sound system.

Acura Prototype RL



RL AWD planetary gearset

Acura Prototype RL—As expected, Acura debuted its next-generation RL prototype with V6 power under the hood. The company remains determined to prove that it can supply high-end luxury and exotic cars without eight pistons.

The new RL is powered by a 300-hp (224-kW) all-aluminum 3.5-L VTEC V6 that is ULEV emissions certified. **Honda**'s traditional front-wheel-drive configuration would be challenged to deliver satisfactory handling with such a powerful engine, so the company has innovated with a new all-wheel-drive system designed to impart the sensations of a rear-wheel-drive sedan.

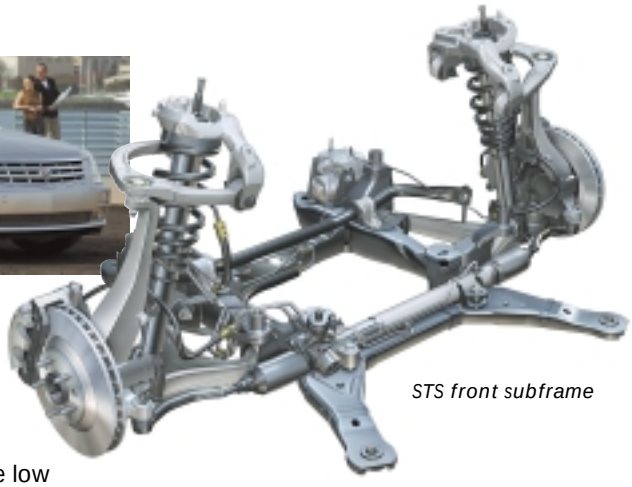
The Super Handling All-Wheel Drive (SH-AWD) system employs a planetary gearset ahead of the rear differential that can let the rear wheels spin faster than the fronts for a rear-drive feel when accelerating out of corners. At the same time, computer-controlled electromagnetic clutches control distribution of power to each wheel, letting the RL put more torque on the outside, more heavily loaded, rear wheel when cornering. The computer uses data gathered by an accelerometer, yaw sensor, and steering-wheel-position sensor to determine power distribution, according to Chief Engineer Minoru Kida. Honda experimented with the concept previously in the front-wheel-drive Prelude SH, "but the computing technology was too immature" for it to work as intended, he said.

The SH-AWD system can vary front-to-rear torque by 70%, and can vary side-to-side torque at the rear wheels by 100%. Under acceleration when cornering, the RL will spin the outside rear wheel faster than the front wheels or the inside rear wheel to induce stabilizing, inward yaw movement. Under deceleration, it also adjusts torque to help stabilize the car, and under straight-line acceleration, it shifts power to both rear wheels for maximum acceleration. The RL uses a five-speed automatic gearbox controlled by steering-wheel-mounted shift buttons.

The real-time traffic navigation system's data is supplied by **XM Satellite Radio** and combines traffic density and speed information to guide drivers around traffic backups. XM will provide traffic information for 20 cities initially.

The RL features extensive use of aluminum for weight savings, including for the suspension arms, subframes, hood, trunk lid, and front fenders. A front impact-absorbing structure Honda calls Advanced Compatibility Engineering (ACE) disperses collision forces over a


Cadillac STS


STS front subframe


Infiniti M45 Concept

larger area to protect occupants and reduce the damage inflicted on other vehicles in a collision.

The RL includes adaptive front lighting that swivels the low beam headlights by as much as 20° in either direction when cornering. The RL also sees Honda's first use of keyless entry and engine starting called Acura Keyless Access System.

Cadillac STS—**General Motors** rolled out its new assault on the midsize luxury sedan market with the new Cadillac STS, which replaces the Seville. The new rear-wheel-drive sedan is based on GM's Sigma platform also seen on the CTS and SRX. Although the STS rides on a 3-in (76-mm) longer wheelbase, it is more rigid than the CTS due to redesigned side rails that have a stiffer cross section, according to Vehicle Line Director Charlie Klein.

"We spent a lot of time on packaging," he said. "This has increased stiffness both in beam and in torsion." Another contributor is a new engine cradle that mounts in six locations instead of four, he said. The chassis resonance frequency is 25 Hz, a 13% improvement over the CTS.

With that stiffer chassis as the foundation, Cadillac employs its two-mode Magnetic Ride Control with comfort and performance settings and StabiliTrak stability control system. **ZF** Servotronic II variable-ratio rack-and-pinion power steering is optional. Extensive use of laminated steel material in ahead of the instrument panel, on shock towers, wheelhouses, and the driveshaft tunnel quells noise before it can reach occupants. A superplastic-formed aluminum trunk lid provides an extremely precise fit, with a single piece that eliminates the center high-mounted stop lamp and license plate surrounds used on the CTS' trunk.

Power is provided by the 320-hp (239-kW) 4.6-L Northstar DOHC V8 or a 255-hp (190-kW) 3.6-L DOHC V6. The Northstar mates to the Hydra-Matic 5L50-E five-speed automatic transmission and the six-cylinder uses the Hydra-Matic 5L40-E five-speed automatic. All-wheel drive is optional for V8-powered models.

While parts of the STS have been seen before in the CTS and SRX, Cadillac has debuted a variety of new electronic technologies in the car. The GM LAN serial data electrical architecture connects as many as 27 separate modules throughout the car on a high- and low-speed data network. Keyless access lets STS drivers enter and start the car without using a key. The remote-start system not only starts the engine from as far as 200 ft (61 m) away, but it automatically adjusts the interior environment of the car using the climate control system, seat heaters and coolers, and front and rear window defrosters if needed. The adaptive cruise control employs a grille-mounted radar to detect objects ahead and adjust speed but adds two new features: grade braking and audible alert. Grade braking downshifts the transmission to maintain speed and distance going downhill, and audible alert notifies the driver when following a vehicle ahead too closely.

The Intellibeam automatic headlight dimming system employs a CMOS (complementary metal oxide semiconductor) camera mounted on the rearview mirror to detect headlights and taillights of other cars, distinguishing them from streetlights and other distractions, to gradually dim the high beams automatically. The lights dim instantly when necessary, as when cresting a hill. Standard headlights are halogen, with optional HID xenon units.

A four-color head-up display projects infotainment data, navigation instructions, automatic cruise control data, shift indicator, and other information onto the inside of the windshield. The 8-in infotainment display in the center stack shows information with full VGA resolution, rather than the quarter-VGA resolution common in such systems, for much better image details. The system's six-disc DVD changer plays CD, MP3, DVD-audio, and DVD-video formats. DVD-video discs play audio when the vehicle is in motion, which is convenient for concert videos, for example, and will play videos on the in-dash display when the vehicle is in park. The interface lets users set presets for all of the available bands, rather than switching between AM, FM, and satellite radio before selecting a station. The 15-speaker **Bose** 5.1 channel surround-sound system uses speakers mounted in the backs of the front seats to provide surround sound for each occupant.

The STS is scheduled for U.S. availability in the fourth quarter of 2004.

Infiniti M45 Concept—Infiniti's next-generation competitor in the midsize luxury segment represents a significant step forward over the current M45, with structural and electronic improvements and exterior styling that coordinates with the rest of the company's range. The M45 Concept is based on the FM platform that underpins a variety of **Nissan** and Infiniti front-engine, rear-drive vehicles, from the 350Z sports car to the FX45 crossover SUV. The chassis, which has 60% unique content compared to those other variants, provides a 40% improvement in torsional rigidity over the current M45 and a 300% improvement in bending stiffness, according to Nissan


Jeep Grand Cherokee

product planner Randy Fior. A new high-strength steel front subframe and steel rear subframe are among the changes to the platform, he said.

The car uses aluminum for the inner and outer door panels, hood, and trunk lid, and the body's styling produces zero front lift for stability. The 340-hp (254-kW) 4.5-L DOHC aluminum V8 and five-speed automatic transmission carry over. The M45 Concept is 4.9 in (125 mm) shorter, 1.9 in (48 mm) wider, and 1.5 in (38 mm) taller, on a wheelbase that stretches 4.2 in (107 mm) longer than the current M45.

The modified FM platform carries a new active rear-steer system designed to help stabilize the car in high-speed corners. The computer-controlled system moves the rear suspension's lower links to modify suspension geometry according to information from vehicle speed and steering-wheel-position sensors. This added stability lets the M45 employ a very quick ratio steering rack without suffering from excessive sensitivity at high speeds, said Fior. "It gives you the best of both worlds:" low-speed agility and high-speed stability, he said.

The M45 also marks the U.S. debut for Nissan's lane-departure-warning system, which aims to address the fact that more than 58% of fatal crashes in the U.S. are the result of lane departure. The system scans lane markings to monitor the distance between the vehicle and the edge of the lane and, considering vehicle speed, issues an audible warning if the car is headed out of the lane. Turn signal use cancels the warning, so intentional lane departures don't trigger warnings, and the system can be turned off completely.

The M45 includes a **Bose** 14-speaker 5.1 channel DVD-audio surround-sound system that mounts rear surround-sound speakers in the backs of the front seats to provide surround for all occupants. The Intelligent Key system provides keyless entry and engine starting, and new voice controls make the navigation system easier to use.

U.S. availability of the production 2006 M45 is scheduled for spring of 2005.

Jeep Grand Cherokee—**DaimlerChrysler** has refurbished Jeep's flagship Grand Cherokee midsize SUV, improving its highway manners while boosting its off-road capabilities. The 2005 model will be the first Grand Cherokee to include independent front suspension, which should dramatically improve the off-road icon's on-road ride and handling.

At the entry level, meanwhile, the two-wheel-drive version has been dropped, replaced by a new system called Quadra-Trac I, which uses the **New Venture Gear** NV140 single-speed transfer case to split power 48/52% between the front and rear wheels. A Brake Traction Control System (BTCS) combines with Quadra-Trac I for added control. Quadra-Trac II, which uses the NV245 two-speed transfer case, gives drivers a low range for better off-road performance and a neutral setting for towing the Grand Cherokee behind another vehicle. Quadra-Trac II also employs BTCS for traction control. Quadra-Drive II also employs the NV245 transfer case, but adds electronic limited-slip differentials for maximum off-road traction. The electronically controlled clutch packs replace the progressive locking differentials in the previous Quadra-Drive system, for even quicker response to changing conditions and greater torque capacity.

That greater torque capacity is needed because the new Grand Cherokee will mark the introduction of **Chrysler**'s Hemi V8 to the Jeep line. The Jeep-spec 5.7-L OHV Hemi V8 produces 325 hp (242 kW) and incorporates the Multi-Displacement System for cylinder deactivation.

The 230-hp (172-kW) 4.7-L OHC carries over as the mid-level powerplant, refined with composite valve covers, structural improvements to the air box and resonator, and heat-shield damping that improve NVH characteristics. The engine also carries new dual knock sensors for better engine-management-system calibration.

The entry-level engine is the 210-hp (157-kW) 3.7-L OHV V6 used previously in the Liberty, replacing the venerable 4.0-L I6. In its new application, the V6 uses a revised cam profile and new valve-lash adjusters to help smooth the idle of the inherently imbalanced 90° V6. A new thick-wall composite intake manifold and structural improvements to the air box and resonator also contribute.

A new W5A580 five-speed automatic transmission backs the V6 engine. Its electrically modulated converter clutch provides partial engagement in the top three gears for improved shift feel, fuel economy, and transmission cooling. The 545RFE five-speed automatic used with the V8 engines includes two second-gear ratios, with a lower ratio available when the transmission downshifts from third gear under acceleration.

The new short and long arm front suspension increases suspension travel by 10%, while reducing unsprung mass by 100 lb (45 kg). Rack-and-pinion steering, new to the Grand Cherokee, improves steering feel, and the Dynamic Handling System (DHS) provides a computer-controlled active antiroll bar from **Delphi** Corp. that only functions when needed for a better straight-line ride and taut handling in curves. The DHS uses a steering-angle sensor, center-of-gravity lateral accelerometer, and upper lateral accelerometer to determine when the antiroll bar needs to be engaged.

The 2005 Grand Cherokee is scheduled to be available in the U.S. in the fall of 2004.

Land Rover LR3—Land Rover faced the same challenges with its Discovery midsize SUV as **Jeep** did with the outgoing Grand Cherokee: balancing on-road comfort with off-road capability. And similarly, Land Rover is introducing a new model that seeks to boost the comfort side of the balance without trading away the

Land Rover LR3

legendary off-road capability that made the company famous.

"Increasing the breadth of capability was one of our main priorities on the vehicle," said Steve Haywood, Chief Program Engineer. Unlike the Discovery, "the LR3's on-road driving comfort and refinement is absolutely no-compromise," he added.

Land Rover showed the LR3 in concept form only, so details are limited. The LR3 adopts the popular styling of the Range Rover to a more affordable model. An asymmetrically split rear hatch/tailgate combination gives customers flexible rear access. Likewise, access to the third-row seats is improved, so they may be reached from the back doors, rather than through the hatch, as is the case on the Discovery. Both second- and third-row seats fold flat for cargo carrying.

Under the hood, the LR3 substitutes a 4.4-L aluminum DOHC V8, derived from the **Jaguar** S-Type's 4.2-L unit, for the aluminum Rover OHV V8 that debuted as a **Buick** powerplant in 1961. The new engine has increased displacement for improved low-end torque, and has modified intake and lubrication systems to tolerate high water and extreme angles off-road. Specific output has not been announced.

The LR3's great innovation is a driver-adjustable traction system called Terrain Response. Using a rotary switch on the console, the driver can choose one of five settings to match the conditions. One setting is for routine driving, and one is for slippery conditions such as wet grass, gravel, or snow. The three remaining settings are for three distinctly different off-road conditions that have dramatically different requirements: mud, sand, and rock crawling.

According to the setting selected, Terrain Response adjusts the ride height (using the LR3's air suspension), traction control, hill descent control, transmission settings, and engine output. The LR3 features automatic locking center and rear differentials, and because they aren't controlled manually, the computer needs to know the conditions so it knows how to control them, said Haywood. "If you are in deep sand, you want the diffs locked up immediately," he said. "But you don't want the traction control coming on." The front differential is open, with grip managed by the traction-control system, and the center diff splits power evenly front-to-rear.

On-road comfort is enhanced by a new independent suspension, six-speed automatic gearbox, adaptive headlights, and DVD navigation.

The LR3 is scheduled to be available later this year.

Ford Escape Hybrid—After a lengthy public gestation period, Ford introduced the production version of its hybrid 2005 Escape compact SUV at New York. All 2005 Escapes wear face-lifted styling, with new front and rear fascias as well as a refreshed interior. Intelligent 4WD is augmented with a more powerful Duratec 23 I4 (vs. the previous Zetec I4) base engine, standard ABS, and an available Safety Canopy side-curtain airbag system.

The Escape Hybrid uses an Atkinson-cycle version of the Duratec 23 that provides about a 4% improvement in efficiency. The fuel savings come at the price of reduced low-end torque, but the 70-kW electric assist motor more than compensates.

Ford Escape Hybrid

Like the **Toyota** Prius, and unlike the **Honda** Civic Hybrid, the Escape Hybrid is a full hybrid, capable of operating on battery power alone at speed up to 25 mph (40 km/h). The 330-V battery pack under the rear load floor contains 250 D-cell-sized nickel/metal hydride rechargeable batteries that are expected to last the life of the vehicle, according to Mary Ann Wright, Chief Engineer. The Escape Hybrid also employs electric power steering to provide power assist even when the Duratec isn't running. For consumer peace of mind, Ford puts an eight-year, 100,000-mi (160,000-km) warranty on all of the hybrid-specific components including the battery pack. The high-voltage power supply lets Ford include a 110-V ac power outlet in the center console for running electronic devices.

Like the Prius, the Escape Hybrid uses a planetary gearset that acts as a continuously variable transmission. Despite the similarities to Toyota's system, and Toyota's calling of attention to Ford's technology licensing agreement, the Escape's hybrid powertrain is entirely Ford developed and produced, according to Wright. "We have no technology sharing with Toyota, and we have no Toyota parts in this vehicle," she said.

Ford's licensing was simply a matter of legal protection, Wright stated. "Because they developed full hybrids first, the breadth of their patents covers everything you would want to do," she said. "So we agreed to license 21 out of their 350 patents to protect us from potential infringement claims." Ford has applied for more than 100 patents of its own on the Escape Hybrid's design.

The Escape not only has Ford's own hardware, it is also programmed differently because of the different


Nissan Xterra


Lincoln Zephyr

requirements of SUV drivers, Wright added. "Our control strategy is completely different, so our customers can tow, and they can go off road." The Escape Hybrid carries a 1000-lb (450-kg) tow rating, enough to pull personal watercraft, motorcycles, or a small boat.

Though official **EPA** fuel economy results for the Escape Hybrid were not available, the company forecasts that it will score between 35 and 40 mpg in city driving and about 30 mpg on the highway. The combined score will represent about a 50% improvement over a conventional Escape.

The Escape Hybrid is scheduled to be available in the summer of 2004.

Ford also announced that the **Mercury** version of the Escape, the Mariner, will add a hybrid version for the 2007 model year. Wright explained the lengthy delay in availability of a virtually identical model as being necessary to optimize the Mariner to the different requirements of Mercury's customers. "Even though they share a platform, we are going to tune it to the requirements of the Mariner," she said. Perhaps those requirements include a V6 internal combustion engine rather than the Escape's I4, which would explain the delay.

Nissan Xterra—Nissan's Xterra adventure lifestyle SUV served as just the quick, low-cost spark the company needed when it was still struggling with financial losses and uninspiring products. The bare-bones Xterra, which was heavily based on the previous Frontier compact pickup truck, appealed to customers whose active weekends demanded cargo space and off-road capability, but who weren't interested in the more suburban SUVs.

The all-new 2005 Xterra is based on the F-Alpha platform shared with the new Frontier and Pathfinder, which is derived from the frame used by the Titan full-size pickup and Armada SUV.

The 2005 Xterra rolls on a wheelbase that is 2 in (51 mm) longer, but overall length is nearly unchanged because of reduced overhangs. The new model is 2.5 in (64 mm) wider and 1.9 in (48 mm) taller. The changes yield small increases in front-seat room, but the back seat gains 3.6 in (91 mm) of legroom and 2.3 in (58 mm) of headroom.

The new fully boxed frame is much stiffer than the previous model, allowing engineers to better tune the ride and handling with springs, dampers, and bushings. Although the Xterra retains the cost-saving solid rear axle and leaf-spring rear suspension, that design has been improved with new geometry and relocated spring shackles for a smoother ride, said Orth Hedrick, Pathfinder and Xterra Product Planner.

Computer-aided design helped engineers place all of the suspension and driveline hardware as high and close to the frame as possible for maximum ground clearance, Hedrick said. "A lot of that was because of our digital development, so they were able to optimize the underfloor package," he said. Xterra carries the latest **Continental**-Teves stability control, hill descent control, antilock brake, and brake assist technology, too, Hedrick added.

The Xterra is powered by yet another iteration of Nissan's VQ aluminum V6. It is the same 250-hp (187-kW) 4.0-L version introduced in the Frontier and Pathfinder, replacing the cast-iron truck engine used previously. Five-speed automatic and six-speed manual transmissions are available, with rear- or four-wheel drive.

Xterra's rear cargo area is rubber-coated for easy cleaning, and Nissan includes mounting tracks in the floor for attaching tie-down cleats, similar to the Utili-track mounts in the beds of the company's pickups.

The Xterra will be available in the U.S. in early 2005.

Lincoln Zephyr—**Ford** and **Toyota** both used the New York show to preview future near-luxury sedans in concept car form. The 2006 Lincoln Zephyr uses the CD3 platform shared with the **Mazda**6 as the foundation for its planned challenger to the likes of the hot-selling **Lexus** ES330 and **Acura** TL. Those cars, too, are built on the platforms of more prosaic high-volume family sedans, but the luxury division versions are regarded as true luxury cars and not merely dressed up mainstream sedans. That is because of unique sheet metal, premium interior appointments, and more thorough attention to details such as triple door seals, thicker glass, and more body welds that reduce NVH.

The Zephyr's airy interior owes its style to the very light colors of the Harewood (a variety of ash) accents and nearly white leather upholstery. While these themes will carry over into the production car when it appears as a 2006 model in 2005, details like the light-colored leather steering wheel aren't realistic for use in the real world, commented Paul Mascarenas, Executive Director of medium and large platforms for Lincoln.

The car's wheelbase and other dimensions are the same as those of the Mazda6, said Mascarenas. "The hard points are all the same, but the tuneables such as shocks, springs, and bushings are all different," he said.


Lexus LF-C Concept


Saab 9-7X

Special engine mounts will help isolate vibration from the 3.0-L DOHC Duratec 30 V6 engine, which will mate to a new six-speed automatic transaxle.

Combined with electronic throttle control and transmission calibration, the transmission promises smooth shifts. The Lincoln version of the Duratec 30 will include variable intake cam timing, but no power rating is available yet. An optional all-wheel-drive system will provide all-weather security.

Lexus LF-C Concept—Lexus' position in the near-luxury segment is solid with the ES330, but the IS300 sport sedan has never made much of a dent in segment leader **BMW** 3 Series sales. The LF-C Concept Car is a peek at Lexus' plan to address that situation, with a more aggressively styled IS300 replacement that will be available in a wider variety of body styles as with the 3 Series.

The LF-C is a hardtop convertible that previews the appearance of the coupe and convertible versions of the upcoming sport sedan. The LF-C rides on a 110-in (2790-mm) wheelbase that is 5.1 in (130 mm) longer than that of the IS300, but shorter overhangs keep overall length about the same. The concept car is 2 in (51 mm) lower and nearly 5 in (127 mm) wider that the IS300.

Anticipating V8 power in the future BMW M3, Lexus plans a V8 for the IS300 replacement. Perhaps, as with the GS midsize sedan, the six-cylinder will continue to be available as well. Rear drive is a virtual requirement for sport sedans, and the layout is retained in the LF-C, driven through a six-speed automatic gearbox.

The retracting hardtop folds into the car's trunk, giving the LF-C the option of working as a coupe or a convertible. The car's tail is shaped to make room for the four-seater's roof to fit inside.

The interior has an open-topped Formula One yoke-style steering wheel and transparent blue instruments. A translucent blue console containing embedded circuitry recalls the appearance of the early computer-animated Disney film, Tron.

Saab 9-7X—Saab continues its product line expansion with the 2005 Saab 9-7X **General Motors**-derived midsize SUV joining its Saab 9-2 **Subaru**-derived compact wagon. The 9-7X, which is based on the GMT360 platform, shares virtually all of its hardware with existing **Chevrolet**, **GMC**, and **Buick** variants, including the 5.3-L aluminum OHV Vortec 5300 Gen IV V8 and the aluminum DOHC Vortec 4200 I6 engines.

Outside, a Saab-styled front clip and taillights unique to the Swedish model serve to differentiate the new version from its corporate siblings. Inside, the 9-7X carries HVAC vents modeled after those of the 9-3, a vertical in-dash pop-out cup holder like the one in the 9-5, and the traditional floor-mounted ignition switch. Saab has chosen green IP lighting as its corporate color scheme, so the 9-7X is so equipped.

Underneath, the 9-7X adds a brace to the front of the frame for increased stiffness, and computer-controlled air springs for the rear suspension. A quicker steering ratio provides more responsive steering, and retuned bushings contribute to better handling feel. A rollover sensing system helps deploy the full complement of front and side airbags, air curtains, and seatbelt tensioners.

The 9-7X will arrive in North American showrooms in the first quarter of 2005.

Mazda MX-Flexa Concept—As the vehicles that are still called "minivans" have ballooned to full-size dimensions, heft, and power, Mazda has spotted a


Buick Velite

niche in the market for a true minivan. The MX-Flexa is a three-row, six-seat van with sliding rear doors that emphasizes comfort for each occupant. Each of the six seats is nearly identical in width for similar comfort.

The MX-Flexa rides on McPherson strut suspension in front and multilink setup in the rear, with a 169-hp (126-kW) Mazda MZR-badged version of the **Ford** corporate Duratec 23 powering the front wheels through a four-speed automatic transmission. Electric power steering provides light steering effort.

Innovations include a detachable warm/cool box located in the center console that works as a refrigerator in the car, or as a cooler when removed. The E-ZZ-FOUR concept bike rack system lets the vehicle carry a pair of bikes inside and two more on the roof.

No production plans were announced.

Buick Velite—The Buick Velite (a name for a class of quick-moving soldiers in Napoleon's army) marks the U.S. debut of a **General Motors** concept car based on the company's upcoming Zeta front-engine, rear-drive platform. The **Opel** Insignia, which bowed in at Frankfurt last year, was the first global example.

The Velite is a four-seat convertible that draws both on Buick's heritage and contemporary style. In a nod to Buick's long history with turbocharging, the Velite employs a twin-turbocharged, intercooled version of **General Motors**' aluminum 3.6-L DOHC V6, with variable cam timing, valve lift, and duration. Output is 400 hp (298 kW), driving through a Hydra-Matic six-speed automatic transmission.

Dan Carney