BRONCO

BUCKING TRENDS:

FORD BRONCO CONCEPT IS AUTHENTIC IN DESIGN AND INNOVATIVE IN TECHNOLOGY

SINCE 1965

Legendary

Bronco

The legendary Bronco is back as Ford re-explores the origins of the sport utility vehicle in a concept making its debut at the 2004 North American International Auto Show. The Ford Bronco concept demonstrates the original's authentic spirit while advancing powertrain technologies.

At a time when sport utilities are becoming more and more civilized – some to the point of forgetting their roots – the Bronco's clean, raw shape, uncluttered interior and capable chassis make it the ideal tool for work, play or just making a statement.

Key design features reminiscent of the original Ford Bronco include the boxy, upright roofline, short wheelbase, round headlamps and the Bronco nameplate milled into the modern three-bar grille. A winch and guide rollers are integrated into the lower fascia. Exterior details include exposed door hinges, cowl vents and flared wheel wells. Unique loop-shaped door handles are integrated into the door panels and open with a tug.

"True to its heritage, the Bronco concept is a tough, genuine SUV that's all about function," said J Mays, Ford Motor Company group vice president of Design. "It's like a claw hammer in a box full of department store, battery-operated, plastic, power tools."

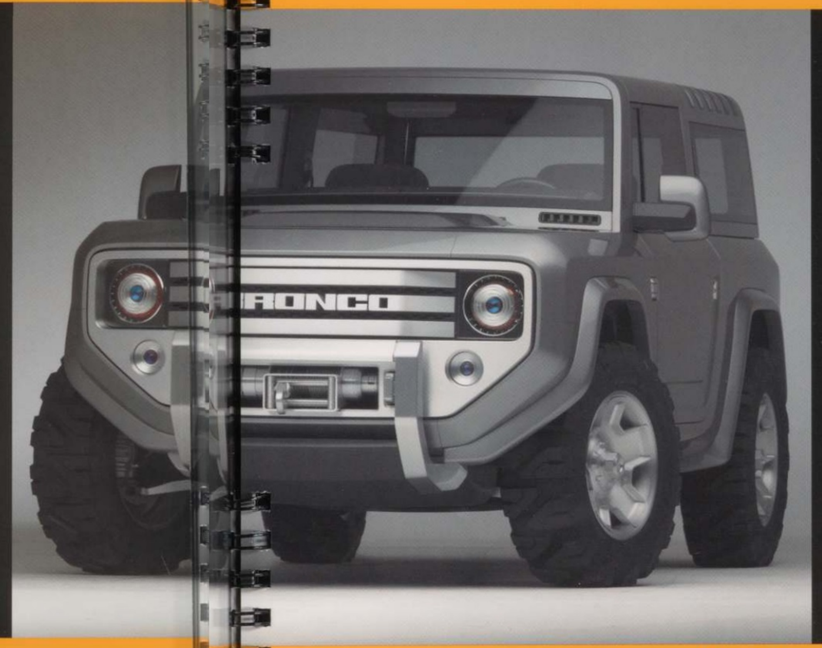
Yet within Ford Bronco concept's rugged design is an advanced turbo-diesel powertrain with concept technologies that stretch the envelope of today's conventional propulsion modes.

Exposed door hinges and U-shaped metal door handles reinforce the Bronco concept's air of no-frills durability.

"The Bronco concept showcases significant advanced powertrain technologies mating a 2.0-liter intercooled turbo diesel with an efficient six-speed PowerShift™ transmission and Intelligent™ four-wheel-drive system for a powerful, sure-footed off-roader," said Graham Hoare, director, Powertrain Advanced and Research Engineering. "Then comes the fun part. We've added nitrous-oxide injection for a burst of power at your fingertips."

Although only a concept, the Bronco demonstrates how Ford could further complement its extensive SUV lineup that includes Escape, Explorer, Expedition and Excursion.

"The original Bronco carved new trails as a rugged off-roader, but Ford really created the SUV phenomenon with the introduction of the Explorer in 1990," said Steve Lyons, president, Ford Division. "Since that time, Ford has always been the clear leader in SUVs. But we will keep looking at new ways to extend our SUV leadership. For example, we're introducing the Freestyle crossover for customers who are looking for a very civilized SUV alternative. At the other extreme, the Bronco concept shows how a small, rugged and extremely capable off-road machine could complement our SUV lineup."



Although only a concept, the Bronco demonstrates how Ford could complement its industry-leading lineup of SUVs.

Confidence

Design

The Bronco concept strikes a familiar profile of the authentic SUVs of the late 1960s and at the same time is contemporary, appealing and relevant for today's market. The Bronco concept adds modern technologies to an original theme for a fresh new approach. The headlamps use LED and halogen light sources to cast a wider beam for better peripheral vision in off-road situations.

The Ford name is integrated into the tailgate that swings open to the side, allowing easy access to the rear cargo area. The taillamps are rectangular and feature LED lights in a cascaded array. Bronco sits on LT 265/70R18 Goodyear all-terrain tires mounted on specially cut 18-inch, six-spoke aluminum wheels that convey the confidence to carry it over any surface in any condition.

The familiar boxy profile of the Bronco concept is updated with modern features, including headlamps that combine LED and halogen technologies.

A full-size spare tire is mounted in the rear cargo area.

The roof is made up of two separate sections. The rear portion can be removed for an open-air driving experience. In another link with the original Bronco, roll bar accents can be attached once the rear portion of the roof is removed, giving the look and feel of a Baja racer. Ford offered customized "Baja Broncos" in the early 1970s.

A monotone color scheme featuring a warm silver finish, coupled with bright anodized brushed aluminum accents, flows seamlessly from the exterior body panels to the exposed interior surfaces. The two seats are trimmed in ginger-hued suede that looks and feels like a leather work glove, accented with same color leather

Seats and door panels are trimmed in rough suede with exposed stitching. Metalwork has a brushed aluminum finish.

inserts and a four-line stitching pattern often found on a rugged tool belt.

The instrument cluster is made up of two round bezels, housing a speedometer and a combination odometer/compass. A lockable glove box features an integrated grab handle that is perfectly positioned to reassure the passenger when traversing rough terrain. Corrugated interior floor panels further communicate strength and durability.

"The Bronco concept is like your favorite pair of worn, faded jeans – classic, familiar, comfortable and always in style," said Mays.

The instrument panel contains only essentials: a speedometer and compass.

Rugged

The Original

Ford introduced the original Bronco in August 1965 as a response to the needs of active Americans who sought adventure as well as practical transportation. Bronco, with a 92-inch wheelbase, was available in three body styles: A four-passenger wagon with a removable full-length roof, a pickup with a half roof and open rear and a two-door roadster with a choice of two- or four-passenger seating.

Like the other no-frills off-roaders of the day – such as the Land Rover Defender and International Scout – the Bronco was both adept and adaptable. Owners loved its ruggedness and the ease with which they could customize it for their needs. Ford offered an array of work-and-play options including winches, snowplow blades, locking front hubs, tow hooks, air-lift springs, an auxiliary gas tank and more.

The original Bronco, built from 1965-1977, was beloved for its rugged simplicity.

The original Bronco was powered by a 105 horse-power inline six-cylinder engine from the Ford Falcon and was mated with a fully synchronized three-speed manual transmission with a column-mounted shifter – its location affectionately dubbed "three on the tree."

The Ford small-block 289-cubic-inch V-8 became available as an option in 1966, upgraded to 302 cubic inches in 1969. Full-time four-wheel-drive uniquely mounted for maximum ground clearance and a solid front axle made it an ideal choice for off-road enthusiasts.

Bronco's sturdy shape is instantly recognizable. The simple, upright stance, signature round headlamps and basic, functional interior are hallmarks of the original design and have made it an icon among hard-core off-roaders.

Bronco was an immediate success, leading the emerging recreational four-wheel drive market with sales of 18,200 units in its first full year of production. Ford continued to update the original Bronco until 1977 – its best sales year – but its last. More than 230,000 were produced from 1966-1977. A much larger Bronco took over in 1978.

The Bronco concept features a built-in winch, rugged front tow hooks and a massive metal bumper. The horizontal grille leaves no doubt about its identity.

The Bronco concept's powerful stance hints at its underhood punch – a modern turbo diesel with overboost function and nitrous-oxide injection.

Duratorq

Powerful Diesel Punch – With a Little Extra Kick

The Ford Bronco concept is powered by a proven 2.0-liter common-rail Duratorq TDCi engine from Ford's European product range. This 16-valve turbo diesel combines outstanding power, torque, smoothness and exceptional fuel economy in a compact package, helping to change public expectations about diesel engines.

Using the latest common-rail fuel-injection technology, the 128 horsepower (130 PS) engine delivers peak torque of 244 lb-ft (330 Nm) at a relatively low 1,800 rpm – an ideal quality for off-roading or urban driving. Plus, Ford has engineered the engine technology to deliver overboost that provides an extra surge of power on driver demand like hill climbing. Overboost generates an even higher torque of 258 lb-ft (350 Nm) for a limited time under full throttle.

Sophisticated, electronically controlled injectors are central to the Bronco concept's common-rail system. The system delivers fuel at extremely high pressure – up to 20,300 psi (1,400 bar) – to the injectors. The fuel is delivered to the cylinders with high precision and control that results in greater performance and torque and excellent fuel economy.

For the Bronco concept, Ford engineers took this punchy engine and went further.

Ford's modern Duratorq TDCi diesel features precise, electronic control.

N_2O

A Nitrous "Kick"

The use of nitrous oxide (N_2O) as a performance enhancement dates back to World War II, when it was employed to give Allied aircraft "emergency" boosts in both airspeed and altitude capabilities.

In the 1970s, nitrous systems saw growing popularity in the automotive performance community among racers looking for that added "kick." The word began to spread when enthusiast publications such as *Hot Rod, Car Craft* and *Popular Hot Rodding* informed their readers by publishing in-depth, technical feature stories on nitrous-oxide systems.

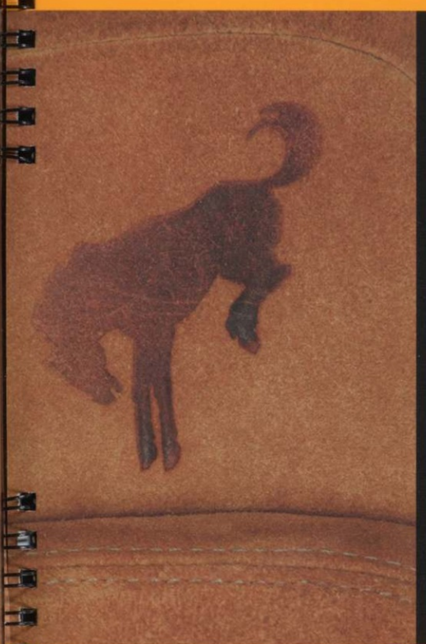
The 2001 movie, *"The Fast and the Furious,"* and its sequel highlighted nitrous oxide use as a performance enhancer among high-revving, California street racers and spread the word to a new generation of enthusiasts.

Interior controls are simple and functional. The top button delivers a performance-boosting shot of nitrous oxide.

How does nitrous injection work? Each nitrous oxide molecule is made up of two parts nitrogen and one part oxygen (36 percent oxygen by weight). During an engine's combustion process, nitrous oxide breaks down and releases its oxygen atoms. This extra oxygen creates additional power by allowing more fuel to be burned. The remaining nitrogen acts to keep cylinder pressures from getting out of hand.

On the new Ford Bronco concept, a stream of nitrous oxide is injected into the engine's cylinders as long as the N_2O button is held down, providing up to a temporary 50 hp boost and a three-second improvement in quarter-mile times, with 10-15 mph more top speed.

"This has practical benefits for an off-road vehicle when you might need a sudden burst of extra power to clear an obstacle and keep moving," Hoare said. "But it also is a blast to drive – literally."



The Bronco concept's "kick" comes from nitrous oxide injection.

Torque

Revolutionary PowerShift Transmission

Power is transmitted to the Bronco's wheels through a revolutionary new six-speed PowerShift™ transmission that significantly improves performance and fuel economy.

PowerShift is the result of a Ford-Getrag joint venture, a transmission that will be seen in Ford Motor Company products later in the decade. In gasoline applications, PowerShift promises a 12-percent fuel economy advantage over today's four-speed automatic transmissions and provides capability to handle a whopping 332 lb-ft (450 nm) of torque in a compact package.

"A twin wet-clutch module replaces the traditional torque converter and operates using hydraulic

The PowerShift transmission, from a Ford-Getrag joint venture, will appear on products later in the decade.

actuation. This feature is similar to the clutch found on a typical manual transmission," said Ernie DeVincent, department manager for transmissions and drivelines in Ford Advanced Research and Engineering.

"However, manual transmissions or automated manual transmissions change gears by disengaging the clutch, which interrupts the flow of torque and can cause rough shifts," DeVincent said. "The PowerShift approach changes gears by power-shifting from one clutch to the other, giving smooth shift quality equal to a typical automatic transmission."

The PowerShift transmission uses a layshaft architecture, which also has more in common

with manual transmissions than typical automatics, with gears arranged on two parallel shafts. Within

the PowerShift transmission, one clutch connects to the odd gears (1, 3, 5), the other clutch to the even gears (2, 4, 6). The dual-clutch layshaft has better mechanical efficiency than conventional automatic transmissions by eliminating the torque converter and the drag losses of an open clutch. A typical four-speed FWD automatic transmission has approximately 68 percent mechanical efficiency (on the EPA fuel economy test), vs. 80 percent for a PowerShift transmission.

Combined with the Duratorq TDCi diesel, the PowerShift promises 5 percent better fuel economy than a conventional six-speed automatic transmission, and 6 percent better acceleration times.

The domed hood provides a fitting home for an experimental powertrain.

Outstanding Diesel Powertrain

The PowerShift transmission makes an ideal partner for the Duratorq TDCi engine. Even efficient, lightweight turbochargers can induce a noticeable delay in torque rise on tip-in because of inertia – the so-called "turbo lag." A twin clutch transmission like the PowerShift offers an advantage because of its lower inertia compared with a typical torque converter, minimizing the effect of turbo lag. In addition, the diesel's low-end torque will allow lower launch rpm, which results in a shorter duration of clutch slip at launch for quicker acceleration.

Diesel engines tend to have differently shaped horsepower and torque curves than gasoline engines, making it desirable to adjust the step size between transmission gears accordingly. Here again, the PowerShift transmission, like all layshaft-based transmissions, offers an advantage. Internal gear sets can be changed easily during development, allowing the efficiencies of common transmission architecture, while optimizing gear ratios for both engine types.

While the shifting is automatic, the PowerShift transmission on the Bronco concept also can be placed in manual mode, with sporty Formula 1-style shifting, using a pair of control paddles on the steering wheel.

The PowerShift transmission is an ideal match for the turbo diesel engine.

Wheels, tires and suspension are optimized for Ford's new Intelligent 4WD System, which seamlessly shifts torque to the tires that have traction.

Seamless

Intelligent 4WD System

The new fully automatic Intelligent™ 4WD System on the Bronco concept will be seen in production first on the 2005 Ford Escape. It replaces the current Control Trac II System and offers better traction and vehicle stability, improved fuel economy and smoother operation.

The automatic system requires no driver intervention and is so seamless in operation that most drivers will never notice that it has engaged – other than being impressed by the system's capability in slippery conditions.

The Intelligent 4WD System uses a fully computer-controlled clutch that engages the rear wheels only as needed. In normal conditions, the Bronco concept is driven by its front wheels. Using sensors at each wheel and at the accelerator pedal, the system's computer calculates – dozens of times per second – exactly how much torque to send to the rear wheels to minimize slip. It can even predict slip and preclude it from happening at all.

The Intelligent 4WD System eliminates one of the drawbacks of other four-wheel-drive systems tuned aggressively for maximum traction, which is a binding effect during tight turns and a feeling of driveline harshness when the system engages. The Intelligent 4WD System can sense tight turns and continuously vary torque to the rear wheels at all speeds, offering the benefits of a "locked" four-wheel-drive system without any of the drawbacks.

The Intelligent 4WD System disengages completely on dry pavement, for supremely smooth operation.

Technology

Bronco Specifications

VEHICLE TYPE
FULLTIME 4WD SPORT UTILITY

VEHICLE DIMENSIONS

LENGTH	4,078 mm
WIDTH	1,861 mm
HEIGHT	1,790 mm
WHEELBASE	2,410 mm
TRACK FRONT / REAR	1,586 / 1,586 mm
FRONT OVERHANG	824 mm
REAR OVERHANG	844 mm
MINIMUM GROUND CLEARANCE	268mm
CURB WEIGHT	3,100 lbs.
TIRE SIZE	265/70R18

2.0L FORD DURATORQ TDCi TURBODIESEL

ENGINE DATA

ENGINE TYPE	2.0L FORD DURATORQ TDCi 16V TURBODIESEL
DISPLACEMENT (CC)	1,998
BORE X STROKE (MM)	86.0 X 86
FUEL TYPE, GRADE	ULTRA-LOW SULFUR PREMIUM DIESEL
MAX HORSEPOWER	128 (178*)
AT ENGINE SPEED (RPM)	4,000
MAX TORQUE (LB FT)	244
MAX BMEP (ISO KPA)	2,076
AT ENGINE SPEED (RPM)	1,800
COMPRESSION RATIO	19.5:1
FUEL INJECTION	DIRECT, DELPHI HIGH PRESSURE FUEL PUMP WITH PILOT INJECTION
TURBOCHARGER	ALLIED SIGNAL GT 20/17V WITH VARIABLE-GEOMETRY NOZZLE AND INTERCOOLER
EMISSION CONTROLS	WATER-COOLED EGR AND OXIDATION CATALYST
EMISSION LEVEL	EUROPEAN STAGE III

* With Nitrous Oxide Boost

POWERSHIFT TRANSMISSION

TYPE	LAYSHAFT BASED AUTOMATIC
NUMBER OF GEARS	6
LAUNCH /SHIFT DEVICE	TWIN WET CLUTCHES
TORQUE CAPACITY	332 LB-FT (450 NM)
RATIO SPAN	6.186
TYPE OF CLUTCH ACTUATION	HYDRAULIC
TYPE OF SHIFT ACTUATION	ELECTRO-MECHANICAL

The Ford name provides a familiar design element on the rear tailgate, flanked by cascaded LED taillights.

CONTACTS

Afaf Farah
1.313.845.0307
afarah@ford.com

Mike Vaughn
1.313.322.3737
mvaughn@ford.com

Jennifer Flake
1.313.337.6839
jflake1@ford.com

Media Information Center
1.800.665.1515
1.313.621.0504
media@ford.com

For news releases and photography
go to http://media.ford.com

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