2009 Honda DN-01

Technical Genius or Marketing Hype?

by Scott Rousseau

In motorcycling, better ideas don't always pan out. Motorcyclists, often creatures of habit and brand-loyal to the bone, will initially bristle at their first glance of cutting-edge alternative technology, but sometimes even the best ideas can be rejected for being too complex or too expensive to be worth making a switch. The James Parker-designed RADD (Rationally Advanced Design Development) front suspension system that graced the 1993 Yamaha GTS1000 sport tourer immediately comes to mind as one such example. A technological revolution, the RADD was a spark of genius that failed to catch fire in the marketplace. Yamaha dropped the slow-selling GTS after 1996, and mainstream motorcycle manufacturers continued to evolve the telescopic fork, a BMW design that first appeared on the 1935 R16 and R17 but didn't come into vogue until the late '40s and early '50s. Ironically, BMW's current seminal models eschew the telescopic system in favor of its unique Telelever and now Duolever technology.

Surely, Honda is hoping that the same fate does not await the revolutionary HFT (Human Friendly Transmission) technology in its jaw-dropping DN-01, a vehicle designed to incorporate the convenience of a scooter with the performance of a full-sized motorcycle. First unveiled at the 2005 Tokyo Motor Show, the DN-01—it stands for "Dream New Concept 1"—was sold in Europe in 2008. For 2009, the DN-01 has come to America.

Engine

When considering the necessary engine requirements for the DN-01, Honda engineers quickly settled upon a V-twin configuration, citing its popularity with sportbike and cruiser riders alike. The DN-01 utilizes a 52° SOHC four-valve 680cc engine architecture that currently powers its Euro-only XL700V Transalp and employs Honda's PGM-FI fuel-injection. Twin 40mm throttle bodies with 12-hole injectors feed the engine, which is fired by a digital ignition. Among its many functions, the ECU controls the DN-01's closed-loop emissions system. On the dyno, the engine is no powerhouse, cranking out 43.3 hp @ 7300 rpm and 33.61 lb.-ft. of torque @ 6100 rpm, numbers that hardly trumpet any sporting intentions—despite the fact that these numbers were attained while the transmission was in Sport mode, one of three driving modes available in the HFT and the only mode in which we could secure a working "fourth gear" long enough to record a run without the HFT catching an upshift. By way of comparison, the Aprilia Mana 850, as of now the only other motorcycle in this new fully automatic category, made 53.6 hp @ 8000 rpm and 38.76 lb.-ft. of torque at 5800rpm. Granted, the Mana boasts 160cc more displacementthan the DN-01, so a qualitative apples-to-apples comparison isn't really warranted. The point to be made here is that the constantly variable transmissions used in the DN-01 and the Mana are so efficient at transferring power to the rear wheel that they don't require superbike-style horsepower numbers to bolster their fun factor. Despite its hefty 602.5-lb. wet weight, the DN-01 feels faster than it is, its power delivery, like its transmission, coming off as very fluid in its performance. The DN-01 scooted past our radar gun with a top speed of 113.1 mph, went from 0-60 mph in 7.41 seconds and posted a best quarter mile time of 15.41 seconds at 87.42 mph. Those numbers are comparable to Honda Shadow 750s that we've tested. Cruiser-like, indeed.

Transmission

Honda's HFT is unlike any other transmission in motorcycling today, even the Aprilia Mana's electronic CVT. The HFT uses no belts or clutches to transmit power to the driveshaft. It's a hydro-mechanical drive that consists of a hydraulic pump and motor inside the same housing. Power is fed from the engine to an angled plate in the pump, known as a swash plate, which contacts the heads of pistons that stroke up and down inside a cylinder block—envision it as appearing similar to the cylinder of a revolver. As the swash plate rotates, the pistons move in and out of the cylinder block, which is fixed in position, and the pistons pump hydraulic fluid—or in the case of the DN-01, engine oil—out of the pump cylinder block through a timed distributor valve and into the cylinder block on the hydraulic motor. Unlike the pump side, the pistons in the cylinder block on the motor side run against a variable angle swash plate. The motor side cylinder block, which is connected to the output shaft, also rotates as the pistons fill and then empty of pressurized fluid from the pump side. The angle of the motor side swash plate is what determines the "gear ratio" being fed to the output shaft until it becomes perpendicular to the drive axis of the cylinder block after the DN-01 has accelerated to the desired speed. At that point, a perfect 1:1 coupling is achieved with the DN-01's 2.833 final drive and any excess oil pressure in the loop is bled off via a complex valve system in the motor-side cylinder block.

In short, the HFT is infinitely variable and keeps the DN-01 operating at maximum efficiency regardless of engine rpm. Thus, it can never be in the wrong gear.

When used in either the Drive mode or Sport mode, the HFT makes the DN-01 feel and operate like a scooter as it upshifts and downshifts seamlessly. However, when used in Manual mode the DN-01 is very motorcycle-like. Its engine rpm drops minutely when the rider rolls off the throttle and uses the +/- shift button located on the left handlebar for upshifts (although full-throttle upshifts are no problem at all). The Manual mode's gear ratios from first through sixth gear are fixed, meaning that you can hold one gear, over-rev and bump the rev limiter, same as you could with a mechanical transmission. However, even in manual mode, while you can downshift to scrub speed as you approach a stoplight, downshifting is not required to return the HFT to first gear. You can simply come to a stop, and the ECU downshifts back to

first gear for you. Conversely, the ECU will not let you upshift or downshift too soon. Also, unlike a scooter, the DN-01 will simulate off-throttle engine braking in all three driving modes.

Chassis & Suspension

Just as the DN-01's drivetrain is a cross between a scooter and a motorcycle, its double-cradle steel chassis is a cross between a cruiser and a sportbike. Its 63.2" wheelbase is definitely on the lengthy side, and its 28.5° rake and 4.33" trail suggest handling that favors stability over razor-sharp agility. Its 27.25" seat height and forward-mounted floorboards are also of cruising lineage, and yet its swoopy styling, single-sided swingarm, five-spoke wheels and sportbike-sized Bridgestone Battlax radials tell another story.

Compared to the techno-trickery of its HFT, the DN-01's suspension is rather mundane. Up front, 41mm conventional forks offer 4.2" of travel but offer no preload, compression or rebound adjustment. In the rear, a seven-position preload adjustable shock is mated to one of Honda's race-inspired Pro Arm swingarms. The rear suspension does not employ rising rate linkage. Rear wheel travel is 4.5".

Despite its length and comfortable seating position, the DN-01's handling is more sport bike than cruiser. An extremely low CofG makes the DN-01 extremely flickable in the turns. Front end feedback is fantastic and confidence-inspiring. The DN-01's floorboards are the only limiting factor in its carving ability. While there is quite an amount of lean angle available before they scrape the pavement, they inevitably do during spirited jaunts.

The DN-01's suspension performance also receives high marks for all but the most aggressive riding. Designed primarily for urban environments, it offers a smooth and supple ride. When pushed to the limits by ace tester Danny Coe, however, we learned that the rear shock could use more compression and rebound damping.

Brakes & Wheels

Braking is another area where some of Honda's technological advancements make an appearance on the DN-01, in the form of Honda's Anti-lock Braking System (ABS) and Combined Braking System (CBS). Dual full-floating 296mm discs with three piston calipers ride up front, while a single 276mm disc is clamped by a Pro Arm-mounted two-piston caliper in the rear. When only the front brake is applied, the system acts as a normal ABS system would, with the ECU monitoring wheel speed and vehicle speed. If the ECU senses that the brakes are about to lock up, it sends signals to electric motor-driven modulators for each wheel that almost instantaneously reduce hydraulic pressure on the calipers to prevent a skid. When the wheel speed once again approaches vehicle speed, the hydraulic pressure is restored. This can happen several times per second in an attempt to ensure optimal braking force at all times.

The CBS system is a smarter version of the linked braking system found on previous Honda touring and sport touring models. Applying the front brake only on the DN-01 will result in normal ABS-assisted braking only at the front calipers, but when the rear brake is applied, the CBS applies hydraulic pressure to the center piston of each front caliper only, leaving the two outer pistons on each side to function with input only from the front brake lever. This is similar to the CABS found on the 2009 Honda CBR600RR.

During testing, Coe achieved a best stopping distance of 124' after figuring out exactly how much lever pressure to use to keep the ABS from activating. We recorded several normal ABS-controlled stops in the 127' range.

The DN-01 employs 17", U-section five-spoke cast alloy wheels wrapped in Bridgestone Battlax BTO 21 radials, a 130/70 ZR17 in the front and a 190/50 ZR17 in the rear. The Bridgestones contribute to the DN-01's sure-footed feel under braking and when hustling through the turns.

Controls & Instruments

The HFT means that there is no need for a clutch lever or a foot-operated shift lever, but shift buttons are mounted on both handlebars. The one just below the on-off switch on the throttle side is used to place the DN-01 into Drive mode, while a forefinger-operated trigger located on the front of the throttle-side switchgear housing moves the HFT Manual mode. A gray switch just outboard of the high/low beam headlight switch on the left switchgear housing is used to toggle the HFT between the Drive and Sport modes, but when in Manual mode, the same button becomes the shifter. The DN-01 also features a hand-operated parking brake to hold it in place when parked, as its lack of a manual, mechanical transmission means that the bike is always in free-wheel mode when the engine is shut off.

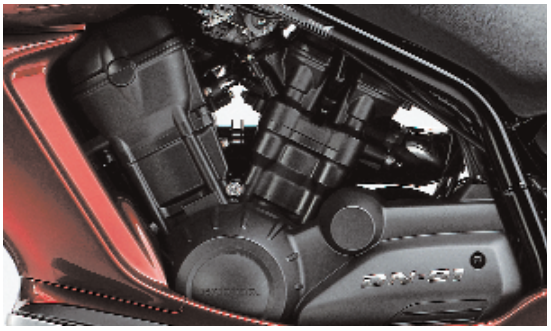
The DN-01's backlit LCD instrumentation includes a multi-segment, bar graph-style tachometer and a digital speedometer with an odometer and dual tripmeters and a six-segment fuel gauge. A selector button and reset button are located on the face of the instrument panel, but the dash's far-away location underneath the low-angled windscreen makes using them on the fly a difficult proposition.

Bottom Line

Initially, our impression of the DN-01 was very favorable. Around town, we appreciated its zippy performance, user-friendly transmission technology, comfortable riding position and the fact that the bike's styling seemed to catch the eye of every other motorcyclist on the road. However, as time wore on, we had a few issues with the bike, such as the fact that for a machine designed with such high functionality in mind it offers no storage whatsoever, or the fact that on sustained freeway rides the lack of wind protection and low handlebar cause you to strain against the wind blast. Then there is the DN-01's confused DNA. Is it a sport bike? Is it a cruiser?

Maybe those questions are moot, because the biggest strike against the DN-01 is its $15,499 pricetag which, more than anything, will keep the DN-01 out of the hands of those who could benefit from it most—beginning or returning riders. Experienced riders with that kind of dough already have a myriad of more focused choices on which to spend it, including Harley-Davidson Dynas, a BMW K1300S, several premium Ducati models or just about every other Japanese motorcycle besides Honda's own Gold Wing and ST1300 ABS.

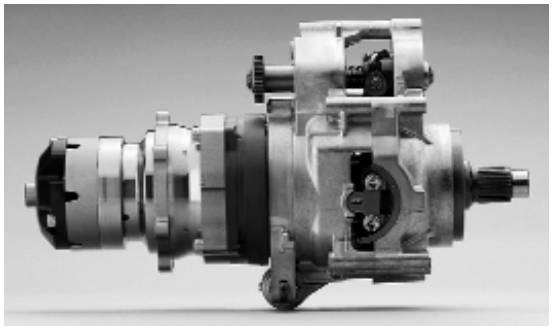
In the end, we are left with a healthy respect for what Honda has accomplished with the DN-01. Whether or not it will revolutionize the marketplace remains to be seen. We only hope that Honda finds a way to give us more than just a passing glimpse of this technology in more affordable and focused models.



Left: The DN-01's 52° V-twin has its roots in the NT650 Hawk of 1968. The current Euro-only XL700V Transalp has it too, but it's retuned and uses a conventional gearbox. The DN-01 is tuned for low- and mid-range power.

Above: The DN-01's single shock is made by Showa and controls the single-sided Pro Arm swingarm without the aid of rising rate linkage. The shock offers seven steps of preload adjustability but does not have any compression or rebound damping adjusters.

Below: View from the cockpit shows the DN-01's digital instrumentation, forward-mounted mirrors and minimalist windscreen. Bottom: The DN-01's passenger seat is comfortable, but we would opt for the accessory backrest from Honda Genuine Accessories.



Above: The heart of the DN-01 is not its engine, but rather its Human Friendly Transmission, a maintenance-free (says Honda) fluid-power unit that provides the DN-01 with seamless shifting performance and infinitely variable gear ratios when used in the Drive or Sport modes. But it can also be shifted manually via a control on the left handlebar.

Right: The DN-01's twin 296mm floating front brakes feature three-piston calipers with ABS. Honda's Combined Braking System (CBS) links the front brakes to the rear only when the rear brake pedal is pressed. The front is independent ot the rear. Only the center piston on each front caliper is activated by the CBS. The outside pistons are controlled by the front brake lever. The DN-01's Showa 41mm forks are non-adjustable.

Testers' Log

A little imagination is all that separates the obvious from the obscure—my co-workers dismiss the noise our editorial printer makes as mere mechanical clatter, while I can clearly make out the opening bongo beat to the Rolling Stones' *Sympathy for The Devil*. The same holds true for the Honda DN-01. Some might say its $15,499 price tag is too expensive, its styling a collision between a Bimota Mantra and an Interceptor underneath a rolling pin, or that its slick-shifting HFT transmission system is a gimmick of no value to "real" motorcyclists. I say Honda has shown real imagination by introducing what might well be the ideal drivetrain for most of us, with the potential to satisfy a wide variety of riders regardless of experience or riding preference. Unfortunately, the first go-round of this new technology is cost prohibitive for the masses. But like computers and cell phones, that could change if Honda sticks with it, adapts it to more mainstream models and increases cost efficiency through volume. If so, I look forward to shelling out for version 2.0—say, a hot-rodded DN1100 V-twin in an RC-51-derived chassis.

—Scott Rousseau

"It's my fault, Dan Gurney's gonna hate me" were my first thoughts on seeing the DN-01. Perry King had loaned us his personal Alligator for testing back in December 2003, and Jon Seidel, Honda's PR rep, had come by for a lunch ride on the Ortega Highway, our favorite test road. So, eager to share the fun of riding such an exciting concept, I let Jon try the Alligator.

When we returned the 'Gator to All-American Racers, Dan's shop in Santa Ana, I mentioned this fact, and Dan's mood turned dark. He'd been attempting to sell the concept to the big OEMs apparently, and now I'd gone and given away his ideas for free. I was sooo sorry. Now, after riding the DN-01, I'm not so worried. The Honda is to an Alligator as a Saturn roadster is to an Indy car. The DN-01 looks great although it's not really a recumbent motorcycle. But I also have to wonder if Honda is serious about automatic transmissions or if they're just padding their résumé of engineering accomplishments. An automatic Gold Wing might command a premium price, but do they really expect many buyers to pay $15,499 for the DN-01?

—Dave Searle

2009 Honda DN-01

SPECIFICATIONS AND PERFORMANCE DATA

ENGINE

Type:..... liquid-cooled 52° V-twin
Valvetrain:.... SOHC, 4 valves per cylinder, screw and locknut valve adjustment
Displacement: 680cc
Bore/stroke: .....81.0 x 66.0mm
Comp. ratio: **10.0:1**
Fueling: .....PGM-FI
Exhaust:.....2 into 1

DRIVE TRAIN

Transmission: **HFT hydromechanical**
Final drive: .....shaft
RPM @ 65 mph*/rev limiter: .....4100 in Drive mode; 5000 in Sport mode; 4150 in Manual mode/8000

*actual, not indicated

DIMENSIONS

Wheelbase: .....63.2"
Rake/trail:.....28.5°/4.5"
Ground clearance: .....5.25"
Seat height: .....27.25"
GVWR: .....941.0 lbs.
Wet weight: .....**602.5 lbs.**
Carrying capacity: .....338.5 lbs.

SUSPENSION

Front: ..... 41mm telescopic forks, non-adjustable, 4.2" travel
Rear: .....Pro Arm w/ single shock, 7-position adj. preload, 4.7" travel

BRAKES

Front: ....ABS with dual 320mm discs, four-piston calipers
Rear: .....220mm disc, single-piston caliper

TIRES & WHEELS

Front:.....**120/70 ZR17** Bridgestone Battlax BT 021 on **3.50" x 17"** wheel
Rear: .....**190/50 ZR17** Bridgestone Battlax BT 021 on **6.00" x 17"** wheel

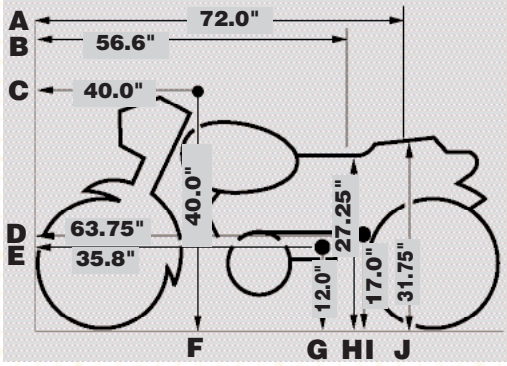
ELECTRICS

Battery:.....12 V, 11.2 Ah
Ignition:.....Digital transistorized
Alternator Output: 449W
Headlight: 55/55W

FUEL

Tank capacity: .....4.0 gal.
Fuel grade: .....Premium
High/low/avg. mpg: 42.6/42.0/**42.3**

ERGONOMICS TEMPLATE

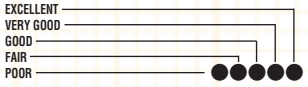


A: nose to middle of pass. seat. **B**: nose to middle of rider seat. **C:** nose to center of grip **D:** nose to pass. footpeg. **E:** nose to rider footpeg **F:** ground to center of grip **G:** ground to top of rider footpeg **H:** ground to lowest point of rider seat. **I:** ground to top of pass. footpeg. **J:** ground to middle of pass. seat.

PERFORMANCE

Measured top speed .....113.1 mph
0–1/4 mile .....15.41 sec. @ 87.42 mph
0–60 mph .....7.41 sec.
0–100 mph .....n/a
60–0 mph .....124.0'
Power to Weight Ratio 1:13.91
Speed @ 65 mph indicated.....64.9

MC RATING SYSTEM



Middleweight Cruiser

Engine	●●●◐○
Transmission	●●●●●
Suspension	●●●●○
Brakes	●●●●○
Handling	●●●●◐
Ergonomics	●●●●◐
Riding Impression	●●●●○
Instruments/Controls	●●●◐○
Attention to Detail	●●●●◐
Value	●●◐○○
OVERALL RATING	●●●●○

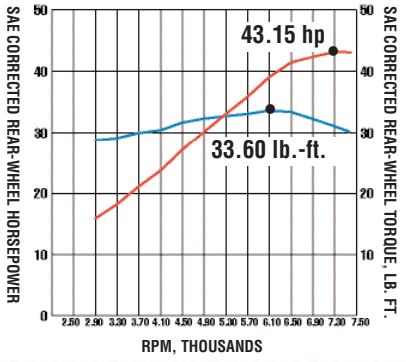
MISCELLANEOUS

Instruments:.....digital speedo, multi-segment digital tach, odometer, 2 tripmeters, gear indicator, clock, six-segment fuel gauge
Indicators: ..... water temp., hi-beam, check engine, t/s, neutral, low oil, ABS warning, parking brake
MSRP: **$15,499**
Routine service interval:.....4000 mi.
Valve adj. interval: .....8000 mi,
Warranty: 12 months, unlimited miles
Colors: .....Candy Dark Red, Black

DYNAMOMETER DATA

Low end	●●●●○
Mid-range	●●●●○
Top end	●●●●○

There isn't much to complain about with regard to the DN-01's engine performance. The 680cc SOHC four-valve 52° V-twin oozes character along with its linear power delivery. It doesn't have to post huge hp and torque numbers to be fun.



TEST NOTES

PICKS

- HFT transmission technology is exciting!
- Electric-smooth power delivery and nimble handling
- Low seat height and ergonomics great for new riders

PANS

- HFT transmission technology is expensive!
- Riding position is unfriendly for freeway droning
- Overall, this motorcycle suffers from an identity crisis

STANDARD MAINTENANCE

Item	Time	Parts	Labor
Oil & Filter	0.3	$60.20	$24.00
Air Filter	0.4	$33.88	$32.00
Valve Adjust	2.5		$200.00
Battery Access	0.9	MF	$72.00
Final Drive	0.3		$24.00
R/R Rear Whl.	1.0		$80.00
Change Plugs	0.3	$11.90	$24.00
Synch EFI	2.0		$160.00
Totals	**7.7**	**$105.98**	**$616.00**

* MCN has changed the estimated labor rate to $80 starting March 2007