

Velocity Racing's '08 Turbo 'Busa

The New 'Busa In AMA Prostar Pro Street Dragracing Guide

Barry Henson and Velocity Racing's latest AMA Prostar Pro Street Hayabusa racebike.

Velocity Racing's in-house designed/built swingarm stretches the wheelbase to the AMA Prostar Pro Street class 68-inch maximum. A dual-rib extrusion design prevents twisting under the monster power produced by this bike. Hidden under the bodywork are various components involved in the control of 500-plus horsepower. The three gauges under the seat show pressure for the air shifter, water injection and boost control, which are all fed by the remote air tank mounted on the rear. The aluminum tank just in front of it is the reservoir for the water injection, with the boost controller situated forward of the reservoir.

Underneath the fuel tank is the custom-fabricated intake plenum for the Velocity turbo system. Note the Tial blow-off valve (which releases boost pressure when the throttle is shut to avoid turbo backpressure) just in front of the plenum. The new stock Hayabusa crankshaft now has grooves cut into the main bearing journals for improved lubrication at higher pressures. Although the overall crankshaft weight is the same as the '07 model, the counterweights appear to be wider and thinner than before.

The new '08 piston (left) no longer has the shallow dish in the center of the piston dome, which helps to increase compression slightly. Note the slimmer skirt design on the new piston. Piston/ring assembly weights are identical at 220 grams.

The new '08 'Busa clutch fiber plates (right) have larger contact blocks for improved durability. This comparison of the old (left) and new (right) countershaft sprockets shows the larger-diameter main output shaft size of the new Busa transmission.

Although the new stock rod and piston pin on the left look very similar to the old components on the right, a close examination shows some small changes to the rod design for '08, as well as the smaller-diameter/thicker-wall pin design for the new model. Rod weights are identical, but the new piston pins are 20 grams lighter, a substantial decrease. **The Falcon Knife rod** and JE turbo piston are far stronger and more durable than even the new stock components, a necessary change to handle the incredible power of the Pro Street turbo engine.

While the general public was eagerly awaiting Internet spy photos of the new '08 Hayabusa, the team at Velocity Racing had already taken delivery of an actual example of the breed and was busy building the bike it would soon be using to campaign in the AMA Prostar Pro Street class. Anyone who follows motorcycle dragracing knows of Velocity's reputation for constructing race-winning machinery since bursting onto the scene in '01. Under the leadership of Barry Henson (owner and rider), Velocity has had an impressive string of nine national championships, and it's not out of the question to believe it will be adding more in '08.

In keeping with the industry adage of "Win on Sunday/Sell on Monday," Velocity has also turned its track success into a thriving business venture. The company is one of the largest and most innovative suppliers of race and street turbo setups for sportbikes in the U.S.A. In fact, it's not uncommon for the team to end up racing one of its own customer bikes during elimination rounds at an AMA Prostar event. Suzuki recognized Velocity Racing's success, and Henson's team now enjoys some factory support.

Henson was given an early delivery of the '08 'Busa so he could get a head start on building the bike his team would use to campaign the '08 AMA Prostar season-and also have it appear for some demonstration runs at the U.S.A. press launch at Chicago Dragway. With a mere six-week window, Velocity had to take everything it had learned over the last six years of dragracing the Hayabusa and get the new '08 version of the team's Pro Street dragbike running in time for the press launch.

Shortly after Suzuki's National Dealer Show, the donor bike arrived at Velocity's shop in Lexington, Kentucky, and we were given an exclusive behind-the-scenes look as the team disassembled the new bike and gave it a thorough examination to see just what internal improvements Suzuki had made to the engine. It's one thing to see component detail photos supplied by the manufacturer, but it's a whole different ball game to actually see all the engine parts out in the open. We were even able to weigh some parts for comparison purposes.

The first components to get some attention in order to handle the high power output of the racebike were the pistons. Velocity has been relying on JE pistons for years in its racebikes, and John Noonan at JE produced a new 8.5:1 compression turbo piston for this application. The new Hayabusa has a 2mm-longer stroke, and since the turbo bike uses the stock crank, JE had to make a piston to utilize the new wristpin location.

On the stocker, the wristpin shrinks from a 19.96mm diameter to a new 17.96mm-diameter piece. This reduction of 2mm in diameter allows the pin to sit 1mm closer to the dome of the piston without interfering with the ring lands. This new geometry is part of how Suzuki achieved the displacement increase with equal-length rods compared with last year's engine.

JE actually reverse-engineered the stock piston design in order to develop a suitable part for the Velocity racebike. For instance, the piston skirts were enlarged to full size, versus the stock unit's slipper skirt design; although it adds reciprocating weight, this helps to stabilize the piston in the bore when the rod is at a severe angle to the bore centerline—a must with the ultrahigh cylinder pressures of a forced-induction engine. The dome is also thicker to withstand the added heat and cylinder pressure of turbocharging.

The next components to be changed out were the connecting rods. Just as with the pistons, the new wristpin diameter required a redesign, even though both old- and new-generation rods are the same length. For several years, Velocity has relied on the Falcon Knife rod in all its turbo racebikes. Manufactured using Timken Var300M forged steel with ARP conrod bolts for high strength, the Falcon Knife design is said to reduce drag and resist twisting better than other shapes. These new rods bolt up to a new '08 Hayabusa crank that now comes from the factory with integral oil grooves on the main bearing journals to provide better lubrication under high pressures.

Even though the new '08 engine gets a completely new cylinder head, it too requires some special treatment to perform as needed. Many people falsely believe that turbo bikes do not need head porting because the air is being forced into the combustion chamber. The truth is that there are still benefits; high-speed airflow is continuing to take place in the intakes, and any improvement in flow results in better cylinder filling. Vance & Hines Racing is entrusted with fully porting both intake and exhaust sides to ensure the cylinder head is not a restriction. The valve sizes, however, remain stock. The stock cam now comes with higher lift, measuring out at 0.040 inch additional exhaust lift and 0.010 inch additional intake lift. According to crew chief Frankie Henson (Barry's brother), these cams are used in the new '08 racebike.

The cams are fitted with fully adjustable cam sprockets from APE to allow tuning for Velocity's specific needs. APE also supplies a manually adjustable billet cam chain tensioner for this application to replace the new direct-port hydraulic cam chain tensioner that is now standard on the '08 Hayabusa. The new engine comes from Suzuki with single valve springs, but Velocity bins those in favor of a heavy-duty, dual-spring design from APE.

When the engine is bolted together, APE is also the supplier of choice for the high-strength studs and nuts used to keep the head in place. At the ultrahigh boost levels seen by engines like this, high-performance studs are absolutely necessary to keep the cylinder head from "shuffling," according to Henson. Cometic is the supplier of a multilayer stainless steel head gasket that utilizes a Viton-coated outer layer (Viton is a high-performance synthetic rubber that withstands heat and corrosive environments better than conventional seals); Cometic also supplies the spring-steel cylinder base gasket.

Another important part is the billet oil pan from RPM Cycle. Not only is it 1 inch shorter for better ground clearance with the lowered bike, but it also has a swinging pickup to prevent oil starvation at launch. RPM Cycle also supplied the clutch slave case support to prevent case flexing or failure under the heavy load transmitted by the MTC full-locking, multistage clutch, encased in a Falcon billet clutch basket. As strong as the stock basket is, it just is not capable of continually withstanding the onslaught of the monster power supplied by Velocity's force-fed engines. Incidentally, Suzuki redesigned the fiber clutch plates for '08, which now feature wider fiber contact points to better handle the increased power of the new, 1340cc engine.

The next big change to the bike is the fitment of Velocity's own in-house-designed and -produced swingarm. The new swingarm brings the bike up from the stock wheelbase of 58.5 inches to the AMA Pro Street class 68-inch limit. Without a longer arm, it would simply be impossible to launch a bike like this off the line under full power. With a bike producing this much steam, however, long swingarms tend to twist under power, so Velocity developed a dual-rib extruded unit to counter that problem.

Connected to the new arm is a Penske rear drag shock. Suspension is an often-overlooked area for a drag racer, but on the strip, a properly set up suspension can make the difference between getting the win light and heading home. The bike is also fitted with a HyperPro steering damper to prevent any high-speed wobbles.

Even though Suzuki redesigned and lightened the wheels for the '08 model, this bike is wearing Velocity's own after-market forged-aluminum wheels produced by Psycho Racing that save a few precious pounds of unsprung/ rotating mass. The rear tire is a Mickey Thompson MCR2-DOT drag tire, while the front wheel is wrapped by a Michelin Pilot from Richie's Tires.

Bleeding off the energy of repeated 200-mph passes is a set of Galfer's patented Wave rotors that are grabbed by Galfer pads via the new stock Suzuki radial-mount calipers. P3 Racing supplied steel-braided brake lines as well as the EK-DRZ2 530 dragracing chain, which is rated at 11,500 pounds tensile strength.

The Velocity Stage-III Race Kit turbo is basically an off-the-shelf product that Velocity sells, but with a few modifications for the '08 bike. Since the throttle bodies on the new 'Busa have different spacing between the number two and three cylinders, the intake plenum had to be revised slightly. The kit includes a Garrett GT-35R dual-ball-bearing turbo easily capable of supporting 500 horsepower; a Tial external 46mm wastegate and a Tial blow-off valve keep boost from getting out of hand. A Magneti Marelli standalone ECU (refined for motorcycle dragracing by Velocity and Steve Nichols of Aussie Imports) controls all the important power-production aspects of the engine, including fuel/ignition mapping, rev limit, water injection, shifter kill times, etc. Velocity uses its own fully adjustable VR-BC1 boost controller to handle the boost ramping. The race kit turbo setup also includes its own custom fuel rail that Velocity developed to replace the dual injectors of the stock '08 'Busa; one single oversize injector is used for each cylinder.

The completed bike is wrapped in all-new bodywork from Catalyst Racing. This body includes an extended rear cowl to cover the extended 68-inch wheelbase of the bike.

Retail on the race kit and standalone ECU is \$16,500. Street racers may opt for the Stage-III Race Kit at a more manageable \$8995. If you are really well-funded, just send the company \$60,000 and a new '08 Hayabusa, and you can have your own AMA Pro Street racebike.

Even though we have seen these Velocity-prepped bikes rip low ETs for years, we had to ask if Henson had any dyno charts for our story. He replied by saying, "A 7.2-second pass at 200 mph is how this story ends as soon as the 2008 AMA season opens; and that is my definition of a successful dyno pull." We have to agree. -Don Smith

FOR PICTURES: http://www.sportrider.com/tech/how_to/146_0801_velocity_racing_turbo_busa/index.html