Surely every engine builder at one time or another has wished they could design an engine and see it come to life. You know — here’s the rule book and a blank sheet of paper — let’s see what you come up with. Well, that’s exactly what happened to V-Twin engine manufacturer S&S Cycle in Wisconsin not too long ago.

You see, George Bryce of Star Racing came up with the idea to bring a bonified V-Twin into the NHRA Pro Stock motorcycle ring. He knew he would need a little help so he contacted long-time V-Twin enthusiast, George Smith, who is CEO of S&S Cycle, for the task at hand. These two leaders in the motorcycle drag racing world teamed up to start a new era in the NHRA.

It seemed impossible to think you could bring a V-Twin into the fray and be competitive. While nearly all of the competitors were using Suzuki based four cylinders and dominating a few lonely Kawasaki bikes, the rule book did allow for V-Twins to compete. This is where it gets a little sticky. Follow closely – Star Racing and S&S Cycle joined forces to bring a competitive V-Twin to the NHRA. Sounds good, right? Well some other guys (Vance & Hines) got wind of the idea and approached the motor company Harley Davidson® about doing a similar program. While Star and S&S struggled building a bike that would be capable of qualifying with the then current rules, V&H was busy politicking the NHRA to bring the old V-Twin section of the rule book up-to-date. Star and S&S saw the possibility of unknown changes and decided to sit on the sidelines until the rules were clarified. Finally, it looked like it was a go. Add fuel injection and allow a 60° engine combo instead of the traditional 45° V-Twin. Now back to what you wanted to read about in the first place — “The Engine!” Right?

With time being so critical in bringing this engine to the market place, there was tremendous brainstorming from both Star and S&S. Even though the boundaries were broad, the decision was made to stay with a larger Sportster based layout for the bottom end, with somewhat of a beeker redesigned case made from billet aluminum. How large you ask? How about large enough to hold a 5-1/8” bore piston complimented with a 3-7/8” stroke flywheel. Who can make a 5-1/8” piston? Just about anyone with a big enough chunk of billet, but let me tell you, you can’t just pick up the phone and order a set of piston rings. Surprisingly enough, with a piston of that size, a 3mm oil ring was sufficient and, to make it even better, a DLC coated titanium wrist pin was added in an industry standard .990 diameter. What about a sleeve for the pistons? You can’t find those on the shelf either. S&S had to make the cylinder and sleeve from one piece of ductile iron just to keep the bore round.

The flywheel was pretty easy as this is what S&S was first founded on – making stroker flywheels for Harley’s®. As we mentioned earlier, the crankshaft is a 3-7/8” stroke and rolls on a ceramic main bearing. It uses billet aluminum connecting rods, which are also made in house at S&S. So now that we have the crank, cylinder and pistons in place, we can move on to the rest of the engine.

Now let’s talk about the transmission. Up until now, this had always been a weak spot with V-Twin drag racing. So when something is not working too well, you need to find out what it is and see if you can make it fit your application. Even though the Suzuki’s had been winning with their 5-speeds, racers had started squeezing 6-speeds into the same gear box with much success. With this in mind, the decision was made to change the overall size of the Suzuki transmission and stick it in the V-Twin case. Heck, while you are there, why not throw in a Suzuki clutch as well. It’s been proven and works extremely well, although gear ratios had to be tweaked for the engine torque and RPM range, this transmission and clutch were a good fit.

Moving back up the engine to the cam chest, you will find a set of four individual cam lobes instead of a traditional 45° V-Twin. Now back to what you wanted...
not work too well when you are trying to achieve one inch of lift. It has a tendency to break the weld. To rectify this problem, one-piece cam shafts were made with the lobe and gear matched for correct cam timing, which falls in the 117 range for the intake and 114 for the exhaust, with duration being around 285 on the intake and 302 on the exhaust at .053 lift. The cams are sandwiched between an inner and outer cam chest. The number two cam also carries the drive gear for the cam assembly, which is driven off the primary gear. This was a pretty complicated process, so the decision was made to drop in a set of standard performance roller cam followers.

Now to cap off the bottom end combination, we add a pair of dual plug billet aluminum cylinder heads. The heads are very unique as they come with 2.700" titanium hollow stem intakes, and 2.000" titanium exhaust valves. The intake seat angle is ground to 55° at the factory for improved air flow. They are connected to the lifters via big block Chevy 2:1 rockers on the intake and 1.850 exhaust combined with a custom made to length push-rod. The ports are hand finished and flow around 3.90 on the intake and 3.65 on the exhaust at .900 lift. Valve springs are set up with a 2.500" installed height and have 425 pounds of seat pressure and 1,100 pounds of open pressure. Sitting on top of each intake track is a seven inch runner with a throttle body over three inches in diameter. This is what feeds the monster engine.

Of course, there are a few other notables to the engine like the use of a two-stage dry sump oil system which carries the life blood throughout the engine. Oil is pulled from an external tank into a junction block that sends oil directly to critical parts of the engine. The oil is then scavenged from the back of the billet oil pan and dumped back into the tank.

There are also two sensors on the engine. One is a cam position sensor which is triggered by a magnet on the rotor button. The second is a crank
position sensor which is triggered by a
relocator wheel located on the opposite
side of the engine behind the clutch drive
gear in the primary housing.

Plus, the engine even comes with
an instruction manual and a complete
parts diagram, which is unheard of in
the racing world. Now having described
the engine in somewhat of a “cliff note”
format, let’s talk about the kind of
performance you can expect to get out
of this new engine design. How about
315 rear wheel horsepower and over
350 horsepower at the crank, not to
mention over 220 foot pounds of torque.

All while turning over 9,800 RPM down
the ¼ mile at speeds well over 190 MPH
with ET’s in the 6:80 range.

So what does all this mean? For
one, it’s obtainable. The S&S engine
is the only V-Twin engine in NHRA
competition that anyone off the street
can purchase. That being said, it has
brought new competitors to the sport as
well as converting a few Suzuki riders
to the V-Twin team. As a matter of fact,
seven NHRA Pro Stock motorcycle
competitors have gotten their very
first win with an S&S engine and
two have gone on to win the NHRA
championship.

Probably the biggest selling point
was when a start-up team had their new
engine purchase shipped from the S&S
factory directly to the race track. The
crew removed the styrofoam packing
and quickly installed the new power
plant in their bike and went on to win
the race. How’s that for “S&S Proven
Performance.” With results like that, it
makes selling these bullets a lot easier for
sure. In fact, over sixty of these engines
have been sold in a little over four years
and have won championships and set
records on three different continents.

Derek Churchwell is from Star Racing in
Americus, Georgia. Star Racing specializes in
parts for older drag bikes and late model sport
bikes. They stock a large and varied selection
of race products including ignition and head
components, valves, sprockets, gaskets,
chains, wheels, brakes, nitrous systems, carbs,
pistons and rings, clutch plates and chassis
components. For more information, call (800)