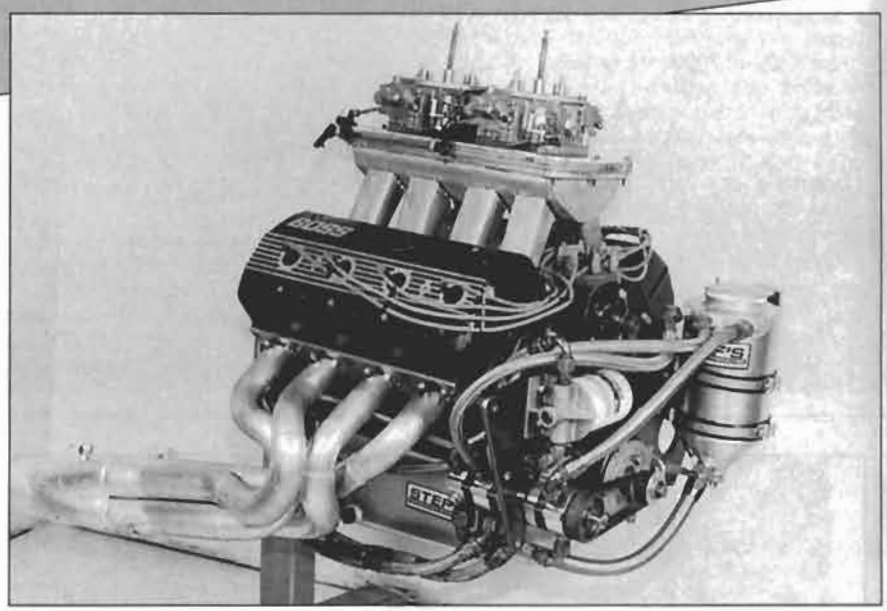
Boss Tour

What makes all the noise inside DSS' Pro Stock Boss 429

text and photography by **Earl Davis**

It doesn't take long for a crowd to form around a Pro Stock race trailer when work begins between rounds. Fans watch intently as the experienced teams service their high-tech Fords until they leave the pits to battle the next contender. Some of the spectators admire the team's smooth, easy grace with tools, others stand, sometimes in the direct afternoon sun, to gather subject matter for a future bench racing session. But altogether, what the overwhelming percentage of these fans have in common is a less-than-complete understanding of what's taking place before them. Spectator interest in Pro Stock is intense, but so is the competition, and that means careful secrecy when it comes to how the power is made and getting it to the ground. Few spectators get the opportunity to see a Pro Stocker or its major components up close.

On a recent trip to Chicago, Tom Naegele and Ron Raffanti, who run a performance machine shop called DSS Competition Engines, invited us to take a photographic walk through their Pro Stock Probe's Boss 429. The 598 cubic inch semi-hemi was being torn down as part of its annual winter overhaul, offering an excellent opportunity to tour the out-sized world of 8000 rpm big-blocks. We discussed the engine at length, including some of the engineering strategies and techniques used to built it, along with the common maintenance necessary when campaigning the complete Mid-West Pro Stock Association's tour. This was no idle opportunity as the DSS Probe is a leading contender in the Mid-West tour, and thus well-illustrates the realities of seven-second Boss power.

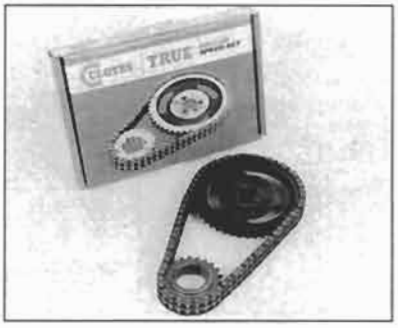


Tom and Ron's aluminum 598 cid Boss engine provides the motivation for their 2350-pound Pro Stock '92 Probe. Bumping an 8200 rpm upper rev limiter, it takes the 1130 horsepower hemi 7.20 seconds to hurl the lightning blue Probe through the quarter at 192 mph. Sixty-foot times bounce around 1.08 seconds.

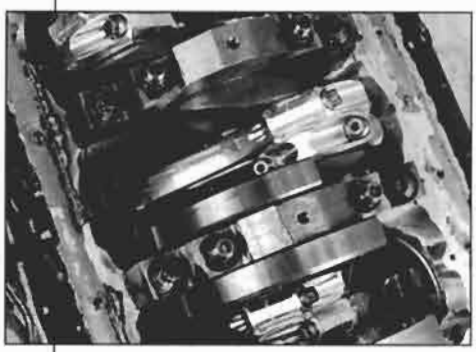
You can't win if you don't finish and you won't finish very often if the engine isn't in perfect condition at all times. Aside from a constant struggle to produce more horsepower through tireless hours of R&D, routine maintenance is the most important and the most time consuming job. Tom Naegele (left) and Ron Raffanti share maintenance responsibilities.

From burnout to speed traps, a typical run takes four minutes or less. Because engine tolerances are calculated for normal operating temperature, the oil must be no less than 180 degrees when the hammer falls. However, the aluminum block dissipates heat so quickly, a light-dimming 212 watt, 110-volt block heater in the oil reservoir is necessary to speed warm-up time. The oiling system holds seven quarts of Valvoline 20W-50 motor oil.

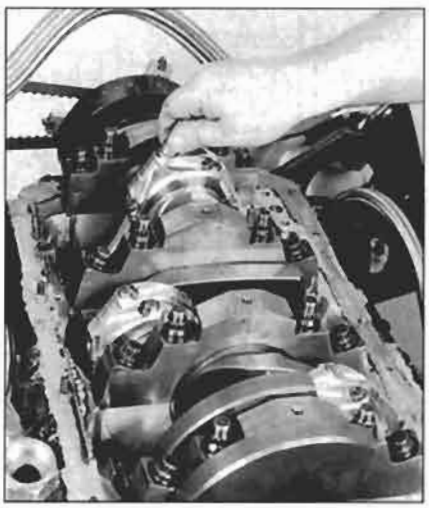
An unavoidable fact of a hemi-head with a pushrod valvetrain is extreme pushrod angles. These steep angles in turn cause excessive side loads in the lifter bores, which DSS bronze sleeves to take the strain. Still, the lifters must be replaced often because the severe loads cause the rollers to wear on one side.



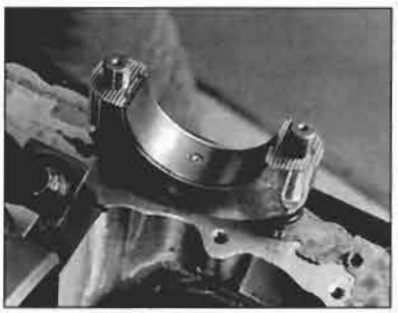
Pro Stock racers don't use camshaft gear drive systems because they transfer damaging harmonic vibrations to the valvetrain which in turn promotes breakage. DSS uses a time-proven Cloyes True Roller cam drive. Attention must be paid to the cam dowel pin as well, as it is caught between the crankshaft and the massed might of the valve springs. ARP cam bolts safeguard against dowel pin breakage and are essential in this application.



In order to maintain a competitive edge and to help prevent a major failure, the aluminum engine is completely torn down and rebuilt after 40 passes. Ron considers align honing a block major repair and should only be done when absolutely necessary. Align honing the mains moves the crankshaft closer to the camshaft, making it difficult to properly center the cylinder bores over the crankshaft centerline. Special undersized timing chains must also be used to counteract the discrepancy. As expected, the aluminum rods are from Bill Miller, the pro drag racer's rod of choice.



A maximum effort 498 cid Pro Stock engine will withstand 9200 rpm bursts while a 598 signs off at 8200. The commonly used 2.200-inch rod journal accepts lighter connecting rods compared to a large-diameter journal. The smaller the main- and rod-journal diameters, the slower their surface speed which equates to less drag. But a small-diameter journal has less bearing load capacity. Thus a large journal runs faster, creates more drag, but handles greater loads. This 598 engine has Cleveland-sized 2.750-inch mains.



The 598's rod bearings have pins and tangs and no oil grooves. Everything in the lower end is only as big as it has to be to reduce reciprocating weight. The 7/16-inch rod bolts, for example, are more than adequate and keep both the bolt weight and rod weight down. Bearing oil clearance is set at .0035-inch.

Compared to a Top Fuel engine, a Pro Stocker requires considerably less maintenance. Bearings are checked only if there is an indication of trouble and changed after 40 passes. Barring major failure, the costly pieces such as the block, heads and crank can be reconditioned over and over. As for the high-fiction pieces — bearings, rings, valvetrain components, etc. — they are maintenance items and considered expendable even after one pass.

These are the most durable valvetrain parts Tom and Ron can buy. The lifters, springs, locks, and retainers are by Competition Cams, the titanium valves are Manley and the rockers by Jesel.

Extremely-light at 600 grams, the gas-ported pistons by Miller take .043 compression, 1/16-inch second and 1/8-inch low-tension oil rings. The ring package is positioned well below the crown to clear the angled valve reliefs. Barring a lean fuel meltdown or an occasional crack, pistons will normally last until the next routine overhaul. Piston-to-bore tolerance is set at .008-inch.

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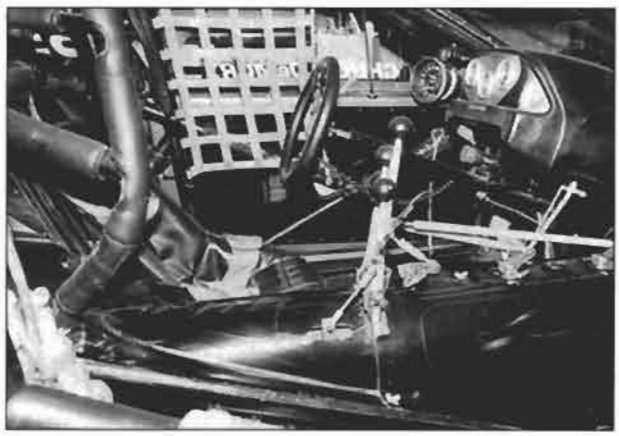
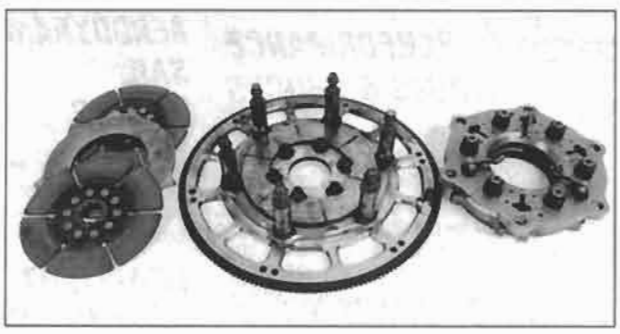
DSS uses modified Speed-Pro bearings and...

...hand-fit plasma moly piston rings. Both are practically the racing industry standard.

The Probe's business office looks busy but in fact is lean and efficient. Driver Chuck DeMory's meetings last for less than a minute with no coffee breaks. Gear changes are dictated to the Lenco 4-speed transmission via a Hurst shifter.



Much of the tremendous performance of modern drag cars is made possible by brutally strong, yet adjustable "slider" clutches. DSS uses an L&T double-disc, 8-inch clutch unit. More or less slippage is dialed into the mechanism to accommodate various track conditions. If the clutch is too loose, it can waste horsepower and cost time. An excessively tight clutch causes violent tire shake resulting in an aborted run.



The two-step rev limiter switch is activated by a switch on the floor-mounted clutch pedal. With the car staged, the clutch and accelerator pedals are on the floor. The switch engages the low-limit rev limiter which will not let the engine spin above the desired launch rpm. Releasing the clutch switches the rev-limiter to its second stage, allowing the engine to rev to redline.

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It's not easy getting a flame front started in the mountainous Boss combustion chamber, especially at high rpm and against a steep Pro Stock compression ratio. This tough job falls to an MSD 7-AL ignition module, which zaps out truly life-threatening electrical bursts to the sparkplugs. The MSD also handles associated electronic chores with its two-stage rev limiter and rpm switches. It's all designed to make maximum power while reducing driver workload.

Source:

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A Racepak on-board computer records the results of each run. Printouts virtually re-enact the pass, providing information about tire slippage, clutch slippage, shift points, fuel pressure, battery voltage, crankcase vacuum, G-forces and driver performance. Such information is vital to reaching modern quartermile performance levels, and it's not trite to say it would be impossible to set up the car without this data. **SF**