

INSIDE KAASE'S SEMI-HEMI

BY RO MCGONEGAL

Undoubtedly, Ford has produced some of the most exotic engines in car junkie history. None of them exist today in their original form, but one of them has recently been revived and is just as cool and intimidating, but with a soul and a disposition for modern times.

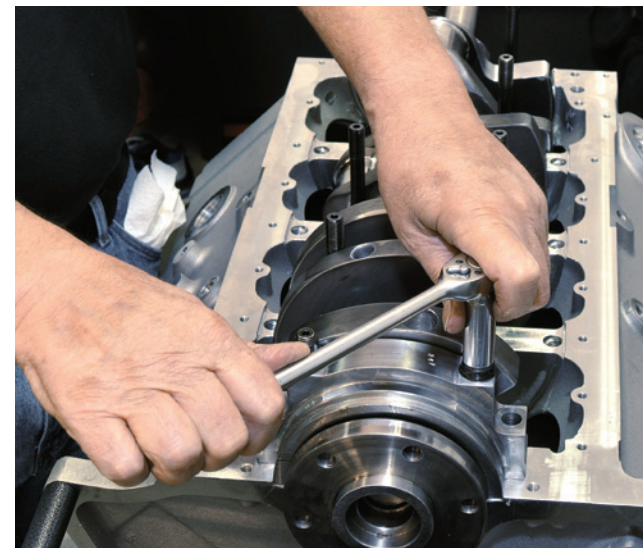
The biggest negative about the original Boss 429 engine was the size of the intake and exhaust ports. Its volumes were so large, they didn't produce viable velocity until the airflow reached the upper rpm band. In short, it was a homologation special built to satisfy minimum production numbers in order to be legal in certain racing organizations.

Jon Kaase Racing Engines in Winder, Georgia, husbanded this remnant a few years ago, and decided to go full steam and make the Boss Nine fully effective for street and recreational duty. For aspiring engine builders, Kaase supplies all the parts needed to build a Boss Nine; alternatively, they'll provide a fully assembled dyno-tested unit. They offer a trio of cylinder blocks from which to choose: stock Ford 429, Ford SVO cast iron, or Ford SVO cast aluminum.

Though more expensive, the advantage of a cast aluminum Boss Nine engine is that it weighs much less than its cast iron counterparts. It also features ductile iron cylinder sleeves that are pressed into the alloy block. This formula removes the threat of coolant in the water jackets making



1 An advantage of the big-block Ford is that it has sufficient clearance to allow a long-stroke crank to function without altering camshaft location. Crankshaft end play should measure between 0.004-0.007-inch.



2 Main caps are secured by 1/2-inch Grade-ten bolts or studs (if aluminum) and torqued to 100 lb-ft.



4 Kaase's experience has taught him all the engine's weak points. This special drilling jig is used to make another hole for an additional dowel in the timing gear. This phase ensures that valve train loads are reliably transferred from the crankshaft to the camshaft.



3 Like most Boss Nine engines, this one receives a hydraulic roller. The copper-coated core indicates this nickel chrome moly cam has hardened journals and cam lobes.



5 This Woodruff key is responsible for locating the timing gear. It's being tapped into place here with a brass drift. The harmonic balancer is driven by another Woodruff key (hidden) further toward the end of the crankshaft.

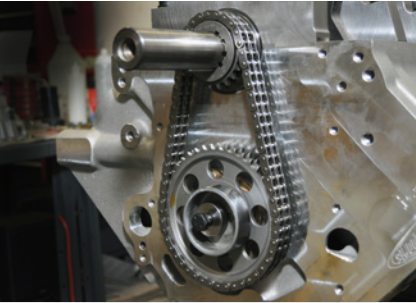
contact with the cylinder liners; thus eliminating certain corrosion troubles. To build cost-effectively, the production passenger car 429 cylinder case is the answer. With a 0.030-inch overbore and a 4.300-inch stroke crankshaft (Scat has an over-abundance of these particular units), the tally becomes 520 cubic inches. Another plus for the BB Ford is that the crankshaft has sufficient clearance to allow a long stroke to function without altering the location of the camshaft, even with a 4.50-inch stroke or 600 cubic inches.

JKRE offers the following stroke

lengths: 3.850, 4.125, 4.250, 4.300, and 4.500 inches. Though the popular cylinder bore choice is 4.390 inches, they can go larger. This is accomplished by Ford's SVO aftermarket blocks that have the capacity to provide 4.600-inch bores. These bigger blocks feature siamesed cylinder cases — there are no water jackets between the cylinders — and cooling is effected on the inside and outside flanks. Indeed, displacement tops out at 605 cubic inches, but the most popular combination is one for 520 or 528 cubic inches. Oiling is available in wet or dry sump configurations, but

street runners usually forgo the dry sump arrangement because it adds complexity and avoids the vagaries of public roads (a stone wedged between drive belt and pulley, for instance). Nonetheless, a dry-sump system adds 40 hp to the total vs. a wet arrangement. The wet sump features a one-way mesh screen bolted to the sump, a 3/4-inch wide metal scraper mounted at the top of the mesh screen and running the length of the screen, and two one-way trap doors in the sump itself that maintain a deep reservoir of oil around the pick-up during hard braking.

Because original Boss hemi heads



6 The crankshaft pulley for the double-roller chain is machined with a series of Woodruff key slots that allow valve timing to be advanced or retarded by 2, 4, 6, or 8 degrees.



7 Diamond-forged pistons are secured to the connecting rods with Trend H-13 wrist pins. The rod bearing caps are secured with 12-point Grade 10 fasteners and tensioned to 75 lb-ft.



8 You can never have too much pre-lube. Pistons are coated with engine oil prior to installation in the cylinder bore. Using 2618 low-silicone forgings, Diamond provides custom pistons for all Kaase Boss Nine engines.



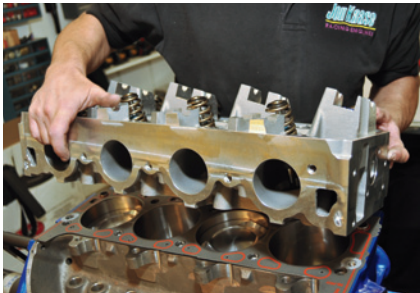
14 Taken directly from its box and without further porting work, Kaase's single-plane intake manifold has flowed sufficient air to sustain 1130 hp. Moreover, on an engine as small as 429 cubic inches, it has supported full engine loads at 2300 rpm. These intakes accept 4150- or 4500-style carburetors as well as Wilson throttle body fuel injection systems.



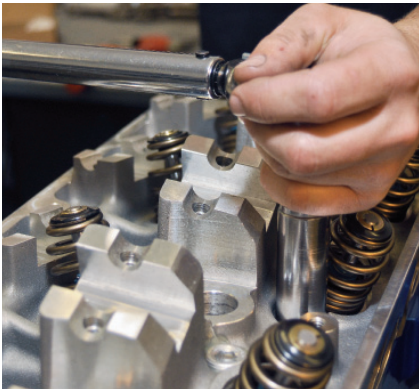
15 Boss Nine engines are dyno tested with all accessories in place to get a true indication of the engine output. Kaase leans on the stick and buzzes this 520 Boss Nine.



9 The shape of the Boss Nine hemi combustion chambers and the angle of its valves make it very efficient, producing easily 100 hp more than an equivalent Wedge-style head. The valves are never shrouded by the chamber or the cylinder walls.



10 In the Kaase hemi head, both incoming and outgoing gases travel a straight path. Because the valves open into the middle of the cylinder, the intake charge is delivered centrally where the spark plug is located. The exhaust gases have an easier exit path, too.



11 Boss Nine heads are secured by ten 12-point Grade 10 fasteners that are torqued to 75 lb-ft.



16 Kaase supplies all the parts needed to build a Boss Nine; alternatively, they'll provide a fully assembled dyno-tested unit.

SOURCE

Jon Kaase Racing Engines / 770-307-0241 / www.jonkaaseracingengines.com

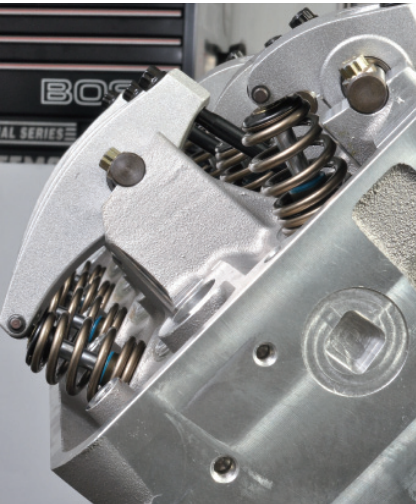
Be aware that camshaft duration must not go beyond 240 degrees lest manifold vacuum be severely compromised and require a booster or canister to retain it. Kaase's Boss Nine depends mostly on the lobe separation angle and multi-phased hydraulic roller camshaft that foment low-speed response as well as a smooth transition from idle speed to fully open throttle.

Mounting the Boss Nine can be done either by a motor plate (to make the drive train angle as straight as possible) or with usual mounting hardware. The front of the standard Boss 429 engine sits 4 degrees up, with a corresponding angle on the manifold boss to keep the carburetor base horizontal. Induction choices include the usual single 4 barrel (4150 or 4500 series) on a single-

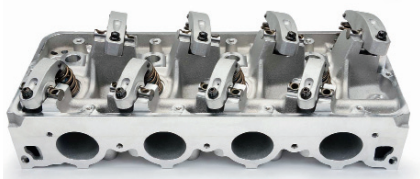
EngSpd RPM	STPPwr CHp	STPTq Clb-ft	EngPwr Hp
3300	343.3	546.4	315.2
3400	356.9	551.3	327.6
3500	387.1	580.9	355.1
3600	395.8	577.5	362.9
3700	409.5	581.3	375.3
3800	437.8	605.1	401.4
3900	448.7	604.2	411.2
4000	463.2	608.1	424.4
4100	480.6	615.6	440.4
4200	490.8	613.7	449.6
4300	500.9	611.8	458.6
4400	503.8	601.4	461.1
4500	514.1	600.0	470.4
4600	551.4	629.6	504.7
4700	559.3	625.0	511.8
4800	591.5	647.2	541.4
4900	594.3	637.0	543.6
5000	608.1	638.7	556.1
5100	621.0	639.5	567.7
5200	632.4	638.7	577.8
5300	634.3	628.5	579.1
5400	638.7	621.2	583.5
5500	649.2	619.9	592.8
5600	654.7	614.0	596.8
5700	659.9	608.0	601.0
5800	667.2	604.2	607.3
5900	673.8	599.8	612.8
6000	681.4	596.5	619.3
6100	684.7	589.5	621.7

17 The dyno shows how capable this serious street performer can be. If these numbers don't impress, Kaase has engine packages that reach well into the four-digit horsepower range.

plane intake, a tunnel ram set-up, a roots-type supercharger, Hilborn stack injectors, or a Wilson 1388 cfm 4-barrel throttle body injector. *CT*



12 Kaase sources his rocker arms from WW Engineering in Dawsonville, Georgia. They are hewn from aluminum billet, afford a ratio of 1.75:1, and are the same stock that JKRE uses on all 820-inch IHRA race motors.



13 The exhaust rockers are a little longer, which moves the pushrod away from the deck. This revision improves pushrod clearance and eliminates grinding the block close to the water ports.

are as scarce as lips on a chicken, Kaase opted to produce his own, infusing them with modifications for increased drivability, low-end response, and a tranquil 700-800 rpm idle speed. The heads have a 5/8-inch thick deck

surface that will easily accommodate very high compression or whatever power adder you choose. The deck thickness of the cylinder heads is greater than the original and though the valves reside in the same place, the rocker arms attach to the head in a more simplified manner, making the assemblies less expensive. The engine will produce the desired power output. The 598 Boss uses ported heads, 12:1 compression, and a roller cam that produces over 1000 hp while the 503 Boss is a hydraulic roller, 9.8:1 compression, and uses non-ported heads. Naturally aspirated engines produce between 500-1000 hp and most enthusiasts opt for performance between 450 and 800 hp on pump gas. Adjunct to the revamped cylinder heads, the miracle of technology runs rampant in the camshaft department.