

You already know that opening up the exhaust on your average internal combustion engine frees up power. You probably even know that the lack of back-pressure makes it easier for the pistons to evacuate the cylinders as they ascend during the exhaust stroke. However, you may not know that there's more to exhaust tuning than simply reducing the restrictions in the system.

It's long been known that joining the two exhaust pipes on a V-type engine equipped with a dual exhaust system will

during the exhaust stroke. Although the X-pipe is usually positioned beyond the headers, it has been shown to have a similar effect on exhaust flow. By running the two exhaust pipes together in this fashion, the alternating pulses in each bank can work to create the same type of scavenging suction in the other.

Nick had the right idea when he looked over the NASCAR guys' shoulders. If it didn't work, they wouldn't be using it. In fact,

we've been told by super-speedway engine builders that the scavenging that resulted from using an X was so great that in some instances, camshaft profiles had to be altered to reduce overlap as the intake charge was being partially drawn out the exhaust.

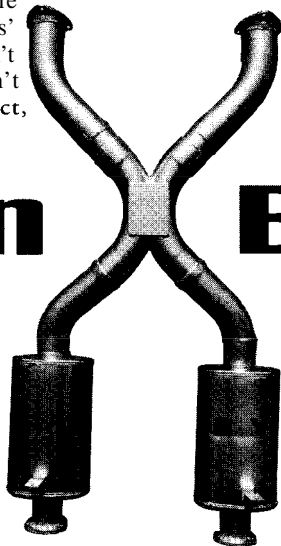
The crew at Supreme was interested in determining if the X would work as well in drag racing, where engines aren't run at sustained rpm. Subsequent testing at

come largely from improving flow out of the engine, reducing some of the pumping losses imposed by the exhaust ports and headers. If an engine is already operating at a high level of volumetric efficiency, there simply isn't that much inefficiency left to overcome. So, a V-8 making 750-800 hp on gasoline will likely gain as much as a tenth in the quarter-mile and around one mph, while a 300-550hp V-8 will often pick up 3-4 tenths and 3-4 mph, over a system using two straight-pipes and mufflers.

Brooklyn X Bridging

HOW EXHAUST CROSSOVERS AFFECT POWER

TERRY MCGEAN



boost power. The added grunt is the result of balancing the exhaust pressures between the two banks of the engine. It's an old trick that even the OEs have been using for decades, no doubt in part for the bonus of a mellower tone.

As the owner of Supreme Automotive, a performance shop in Brooklyn, New York, Nick Filippides is always on the lookout for tricks like this—stuff that will help him find the next handful of horsepower for the latest project. So when Filippides saw that the NASCAR guys were beginning to use "X-pipe configurations on the exhaust systems of their stockers, he figured there had to be something to it.

Indeed there was. The X-configuration in the exhaust enhances the scavenging effect many racers seek. "Scavenging" is the term used to describe the suction effect that can be developed inside the exhaust system. Traditionally, this effect has been designed into tube headers, where exhaust pulses are directed together in such a way that they "pull" on adjacent tubes, aiding in the evacuation of the combustion chambers

Above: Supreme Automotive in Brooklyn, New York, specializes in high-performance automobile service, including custom large-diameter exhaust system fabrication. This experience led proprietor Nick Filippides to begin experimenting with X-style exhaust crossover pipes. The positive results fostered further development and the introduction of a line of X-pipes, dubbed X-Force Technology. The concept was gleaned from NASCAR, and the effects of joining the two exhaust pipes in this fashion serves to create an enhanced scavenging effect, aiding in the evacuation of the combustion chambers during the exhaust stroke.

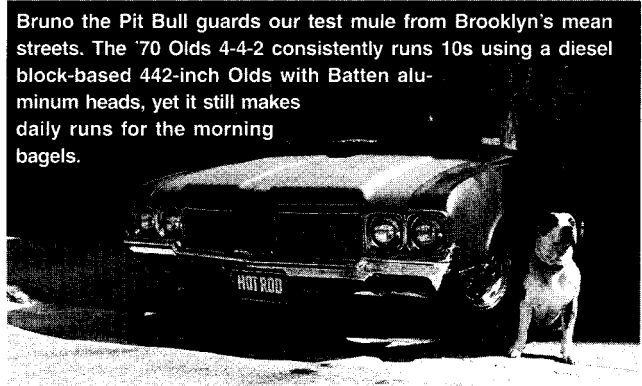
the track and on the dyno showed that it did in fact make more power—quite a bit more in some cases—and thus the X-Force Technology line of exhaust crossover pipes was spawned. Filippides has continued to develop the line of X-pipes, varying the characteristics of the merge and charting power gains in various applications.

Although the X is race-bred, Nick's experience has shown that nearly optimized cars will actually show less gain than more typical street performance cars. He attributes this to the efficiency of a car that is at or close to its peak potential; the benefits of the X-pipe seem to

Filippides currently offers the X-Force Technology X-pipes to the public, and made-to-order crossovers are also available. Although you can't get a complete exhaust system mail-ordered from Supreme, it does offer this service at the Brooklyn location.

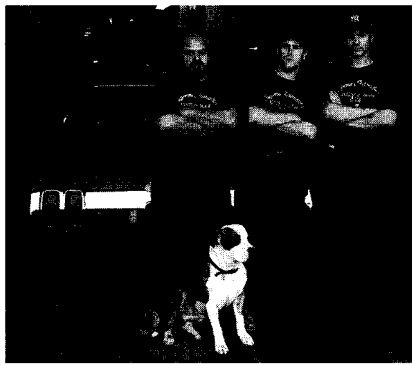
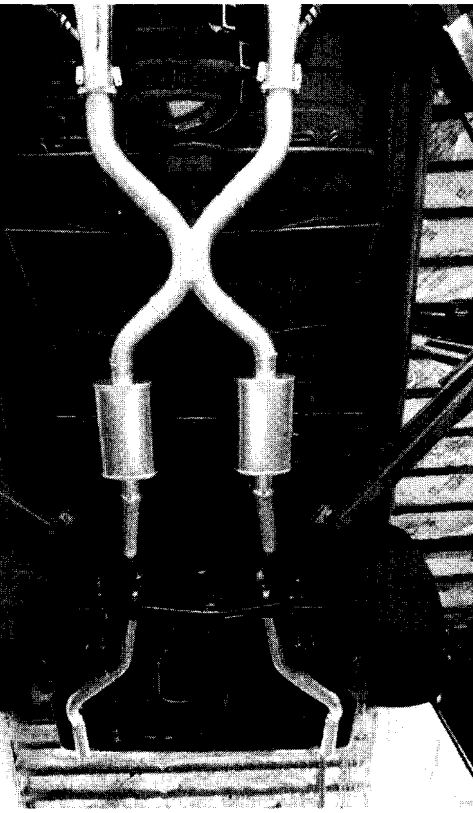
The Mule

In true East Coast fashion, Filippides didn't want us to take his word on how effective the X-Force Technology is—he wanted to prove it. To that end, he enlisted the assistance and wheels of associate Willie Egdorf, owner and pilot of a street-driven '70 Olds 4-4-2 that regularly turns 10s at the track. Did we mention that Oldsmobiles are a specialty at Supreme? The W-machine cranks off those e.t.'s with pure Rocket power in the form of a 442-inch diesel block-based monster. The foundation is a 5.7L (350) Olds diesel small-block fitted with a custom-machined 455 crank and big-block Chevy rods. It's topped off with Batten aluminum heads and an Edelbrock Victor Jr. small-block Olds manifold, designed for NASCAR and not cast since the '80s. A Holley



Bruno the Pit Bull guards our test mule from Brooklyn's mean streets. The '70 Olds 4-4-2 consistently runs 10s using a diesel block-based 442-inch Olds with Batten aluminum heads, yet it still makes daily runs for the morning bagels.

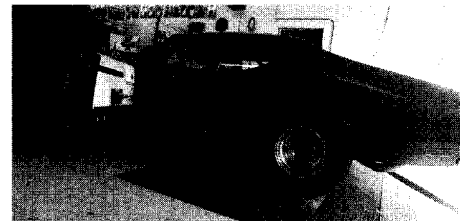
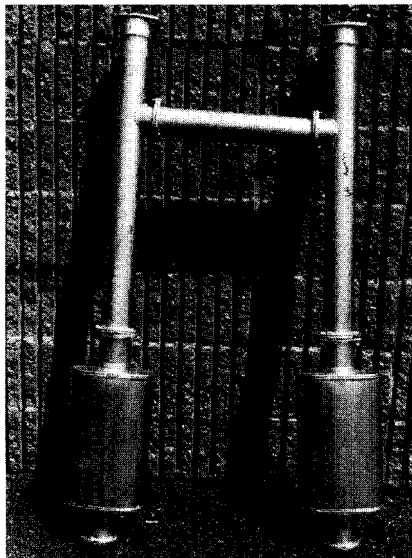
Photography: Jeff Koch



The Supreme Team (from left): Nick Filippides, Joe Novello, Phil Shank, and of course, Bruno. Nick would like to thank Dan Olsen, Anthony Bama, and Robert Vollkommer for their contributions to the project. Supreme offers the X-Force Technology line of X-pipes through mail order, or drop by the Brooklyn shop for a complete exhaust system installation.



We tagged along with the Supreme Automotive crew as they traveled to Lizzard Racing in West Babylon, New York, for chassis dyno testing. While the Lizzard staff strapped the 4-4-2 to the Dynojet, Filippides unbolted the exhaust in preparation for the open-header baseline. Soon after, we had our first figures: 429 hp at 6,850 rpm and 384.5 lb-ft at 5,600. We were pretty sure that these would be the highest numbers we'd see for the test, since all of the other configurations involved mufflers.



Next, a 3-inch H-pipe system was installed (left), also using a pair of Straightline Performance mufflers and 2½-inch tailpipes. First, the H-crossover was capped off, so this system was simply straight dual exhaust. No one was surprised when the power fell off to 412 hp at 6,650 rpm and 371 lb-ft at 5,600. However, when Nick bolted in the crossover, the results were encouraging: 419 hp at 6,600 rpm and 378 lb-ft at 5,600.

Willie's Olds now runs a full exhaust system, consisting of 3-inch tubing, an X-Flow Technology X-pipe, a pair of Straightline Performance mufflers, and 3-inch, non-mandrel-bent tailpipes, exiting in the factory exhaust cutouts in the bumper. With this setup, Egdorf claims he finds no reason to run open headers at the track, as he once did when running a conventional dual system. Filippides felt dyno and track testing would more clearly illustrate the benefits Willie was realizing.

1050 Dominator is the cherry on top, and the power goes through an FB Transmissions TH400 to a Dana 60 rear fitted with 4.56:1 gears. The rear is positioned with a ladder-bar suspension, fabricated by Farks Supercars, also in Brooklyn.

The Feel at the Wheels

After talking Willie into using his Olds as the test victim, Nick set up a test session at Lizzard Racing in nearby West Babylon, New York, where the 4-4-2 was strapped down to the Dynojet chassis dyno. After the testing began, Nick feared that the torque converter in the car was really too loose to clearly illustrate the effects of the exhaust on the car's power band. The Turbo 400 was using a 5,600-rpm converter, which meant that the pulls didn't begin until that rpm. Despite this, the testing did reveal interesting results.

First, the Olds was run with open head-

ers to establish a baseline. Generally, high-rpm engines like this one will respond most favorably to no pipes at all, benefiting from the absolute least amount of exhaust restriction. The Rocket engine shook the walls with a deafening roar on its way to generating horsepower figures of nearly 430 at 6,850 rpm and 384 lb-ft of torque at 5,600. We suspected that these might be the best numbers we'd see for the test, since the other configurations included mufflers. Nick then bolted up the exhaust system, consisting of 3-inch tubing, a pair of Straightline Performance mufflers, and 3-inch tailpipes (non-mandrel bends) exiting in the 4-4-2's factory exhaust cutouts. For the first set of pulls, no crossover of any kind was used, and as expected, power dropped way back to 412 hp at 6,650 rpm with 371 lb-ft, still at 5,600. With this exhaust, the engine sounded like a raucous track car; not as violent as open pipes, though still quite loud,

and deceleration created a sharp rattling sound. Now we were fairly sure the open-header combo would be head and shoulders above all else.

The Supreme team was able to quickly install the H-crossover between the two head pipes, as Nick had installed flanges for the test. The Olds was run again, this time producing a noticeably softened tone, and with less of the "rapping during decel. We were soon pleased to see that the output actually climbed back to 419 hp at 6,600 rpm and 378 lb-ft at 5,600—not as good as open headers, but notably better than the straight duals. This seemed to verify the value of even a simple crossover, but we were still way down from the open-header figures.

Finally it was time to step up to the X-pipe, which was bolted in place of the H-pipe, and also used 3-inch Straightline Performance mufflers and the same tailpipes.

Despite having roughly the same length and the same mufflers, the X-system sounded noticeably different than the H; it was considerably less choppy, emitting a smooth howl up through the rpm range. But the real benefit was in the numbers—428 hp at 6,600 rpm with 391 lb-ft at 5,600. With the X and mufflers, the Olds had cranked out just about the same horsepower as with no exhaust at all, and picked up a handful of torque as a bonus.

Timeslips Don't Lie

We were pleased with the dyno results, but Nick wasn't done. Filippides wanted to demonstrate the net result of the X—the part that his customers actually care about. So it was off to Raceway Park in Englishtown, New Jersey, for drag testing. The various exhaust setups were run just as they had been on the dyno, though the straight pipes were omitted, as they had shown no benefit.

First up: open headers. With Willie at the wheel, the Olds lunged to a 1.65-second 60-foot time on its way to a 10.885 at 123.89 mph. This was the best of several runs in this configuration, and again, we expected it to be the best of the test. While the car cooled, the team bolted on the H-pipe system, and subsequent runs showed that the e.t. had dropped back to a best of 11.007 with a 121.33-mph trap speed. This run actually had a quicker 1.55 60-foot time, suggesting that a loss of power was re-

Right: After a tricky wrenching session swapping the still-hot H-pipe for the X-system, the Olds was again run through its paces. When the results appeared on the monitor, we were impressed: 428 hp at 6,600 rpm with a 391 lb-ft torque reading, the highest of the entire test. The Olds was making just about the same horsepower as open exhaust and a bit more torque, yet it was blowing through a complete system, including mufflers.

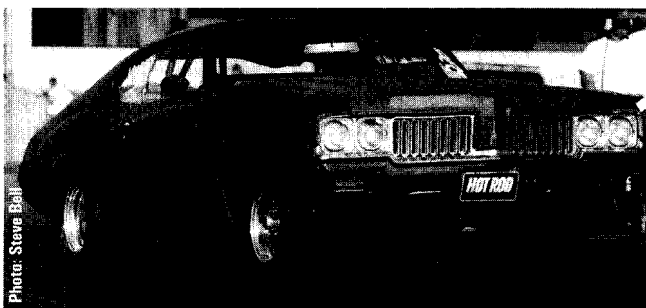


Photo: Steve Bell

up. Again we started with open headers, generating a 10.885 at 123.89 mph with a 1.65 60-foot time. The H-pipe exhaust started with a strong 1.55 60-foot but ended with a 11.007 at 121.33 mph. Nick speculated that a loss of torque may have helped the launch, since the tires were nearly used up—the X-pipe run backed up his theory. The 60-foot fell back to 1.62, but the e.t. improved to 10.89, nearly matching the open-header run. In fact, the trap speed was a best-of-the-test 124.13, indicating the highest power of the test. Keep in mind that the car was totaling nearly 60 extra pounds over the open-header pass.

sponsible for the degraded quarter-mile performance. Another cool-down period and another exhaust swap to the X-system before returning to the line. This time the 60-foot fell off a hair to a 1.62, and by the eighth-mile, the mph was only 100.11—it had been 100.48 by that point with open headers. Seconds later, the clock lit up with a 10.897 at 124.13 mph. Somewhere in the last half of the track, the Olds really came on, giving us our best trap speed of the day and coming within a hair's breadth of the open-header e.t. One more experiment involved removing the tailpipes, but the numbers stayed the same.

We were convinced that Filippides had made his point, but he would have liked the Olds to pick up a little more e.t. We also hadn't considered that the X-system added 58 pounds to the car's weight. Remember that open headers are not only verboten on the street, but at a number of track events as well. Matching or possibly besting the power of open headers while enjoying civilized exhaust tones? Sounds like a success to us. **HR**

Sources

Lizzard Racing
Dept. HR06, 20 Eads St., West Babylon, NY 11704;
888/LIZZARD; www.liuardracing.com

Supreme Automotive
Dept. HR06, 1419 64th St., Brooklyn, NY 11219;
718/232-4646; members.aol.com/xforcefast



The Supreme testing included a dragstrip session at Englishtown, New Jersey's Raceway Park. Egdorf did the driving for all combinations. The straight-duals were omitted as they had proven to be the least favorable set-