Carb Shoot 3

Well this is sort of backwards… I probably should have started with the smaller carburetors and worked up but for me the bigger carburetors are more interesting. I was willing to dump some cash to explore the bigger carb selection as it fit the projects I was working on at the time. Recently I was offered 2 takeoff carbs to test that could be used in milder builds. Two enthusiasts from the Harley Teck Talk forum (groups.msn.com/harleytechtalk), WannaBMayor and RedPanHead offered up a HSR42 Mikuni with Screaming Eagle (SE) air cleaner adapter and a SE CV44 with SE intake manifold for 44 carb. I still have a takeoff CV40 carb, circa 2001 SE air cleaner backing plate, stock manifold, the HSR45 and other miscellaneous parts to run the tests. I probably should have added an SnS super E to the list but since it didn't use the same manifolds as the Mikuni's and CVs it would have made the testing a little more cumbersome. Most importantly, I don't currently have one that's available.

For the most part, the carb shoot 3 testing was done separately from the previous tests and involves a little more manifold testing. It can be compared back to the original tests to some extent but should be taken more on its own. I included the mechanical dimensions of all the carbs here so that they can be compared here. If you look at the CV40 and HSR45 tests in carb shoot 1 you'll find the flow measurements close but not exactly the same.. Measurements were done a different pressure and calculations came out slightly different. Still they are very close.

Anyway, the carbs… Here is a picture of the carbs tested.

Figure 1The Carbs

The CV40 and HS42 are on the left. The 44 and 45 are on the right.. Both CVs look identical except for the additional fitting on CV40 that has the hose hanging off of in the picture. Slides, covers, all other pieces look identical.

Here are the carb specs on for all the carbs so that you can compare their relative sizes, maybe formulate some ideas about flow.

Carb Name	Venturi Diameter	Venturi Area	Greater than Stock	Carb Exit Diameter	Carb Mouth Diameter
Keihin 40mm CV	1.535	1.851	1.000	1.590	2.336
Keihin 44mm CV	1.652	2.143	1.158	1.722	2.338
Keihin 51mm CV	1.930	2.926	1.581	1.995	2.520
Woods 505	1.972	3.054	1.650	1.995	2.520
Mikuni HSR42	1.654	2.149	1.161	1.655	1.790
Mikuni HSR45	1.770	2.461	1.330	1.770	1.861
Mikuni HSR48	1.885	2.791	1.508	1.885	1.975
SnS Super E Tjet	1.563	1.917	1.036	1.875	2.190
SnS Super G Stock	1.750	2.405	1.300	2.060	2.190
SnS Super G Modified	1.860	2.717	1.468	2.060	2.190
SnS Super D	1.950	2.986	1.614	2.247	2.375

Table 1 Carb Inner Specifications

From the Venturi size is seems like the Super E should have been in this comparison.

I've also include some of the over all dimensions so that you can get an idea of the over all carb size.

Carb Name	Back Type	Carb Mount	Carb Front Type	AC Mount	Carb Front to Back Length
Keihin 40mm CV	Spigot	1.810	Flange	2.736	3.924
Keihin 44mm CV	Spigot	1.931	Flange	2.736	3.920
Keihin 51mm CV	Spigot	2.245	Flange	3.020	3.920
Woods 505	Spigot	2.245	Flange	3.020	3.920
Mikuni HSR42	Spigot	1.815	Spigot	2.556	3.555
Mikuni HSR45	Spigot	1.937	Spigot	2.568	3.550
Mikuni HSR48	Spigot	2.092	Spigot	2.565	3.550
SnS Super E Tjet	Flange Bolt space	2.750	Flange	2.690	3.500
SnS Super G Stock	Flange Bolt space	3.100	Flange	2.690	3.500
SnS Super G Modified	Flange Bolt space	3.100	Flange	2.690	3.500
SnS Super D	Flange Bolt space	3.100	Flange	3.025	4.913

Table 2 Carburetor Outer Specifications

You can see that the HSR42 and CV40 have the same spigot size as do the CV44 and HSR45.

Notice that other than the spigot mount on the Mikunis, they are pretty much the same size. The CV44 and CV40 are pretty much the same also. The CV51 had to get a little bigger.

Anyway the carbs got my standard setup for testing in the flow bench.

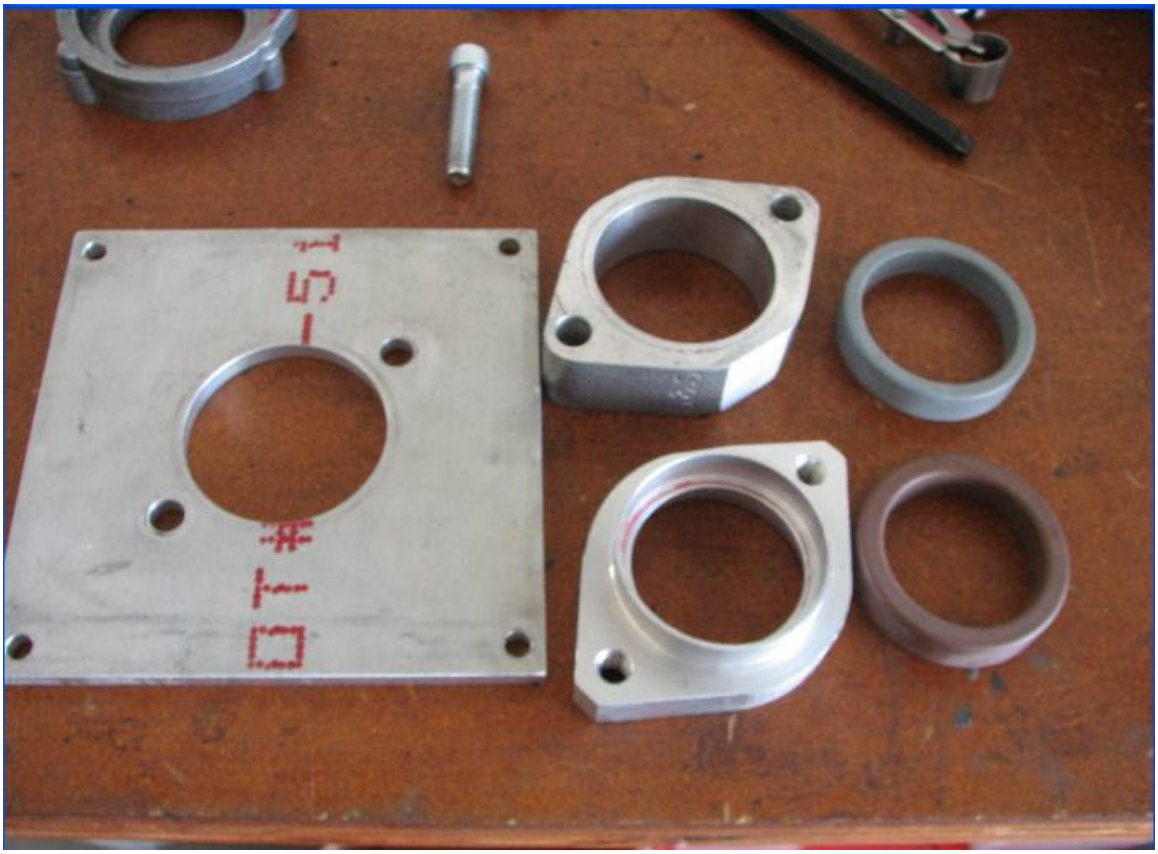

Figure 2 Pieces for Testing Carburetors on SF110

These parts let me swap the carbs back and forth pretty easily. I did have to swap the air cleaner backing plate and the enrichner plug, as I didn't want any carb to have an unfair advantage. I planned on testing without the plate, with the plate and with a velocity stack on the HSR Carbs. The Mikunis flowed so well in the end, the stack made little difference.

Here is a picture of the backing plate on the CV44.

Figure 3 CV44 with Air Cleaner Backing Plate

Kind of looks like the CV 40 from here.

Since the CVs need a bit of flow to pull the slides up and I didn't want the slides affecting the amount of flow. I removed the slide springs as in the last test and used some modeling clay to hold the slide up and the needle in place at the same time..

Carbs ended up looking like this after I wire the throttle plates wide open.

Figure 4 The 2 CVs

I've seen a version of the CV44 that had a plastic slide that sort of hung down in the Venturi but this CV44 slide looked exactly the same as the CV40.

Since the HSR carbs have a spigot type intake the aftermarket has come up with an adapter that allows the HSR carbs to fit in the same place as the CV carbs.

Figure 5 HSR to Backing Plate Adapter

The inside diameter of this ring is almost exactly 1.800 inches. If you look at the HSR45 intake diameter, it is 1.861 inches. It looks like it might cause some restriction.

This picture shows the ring fit on the HSR45.

Figure 6 Adapter with Backing Plate on HSR45

Since I was running smaller carbs, I figured that I'd change the test to the highest value that the Superflow SF110 could handle. This maximum turned out to be 5 inches of water. Maximizing the pressure helps to make the measurements a little more accurate and I wasn't sure how close they would be.

Figure 7 HSR45 on Bench, Initial Run

With the HSR45, the bench could just barely pull 5 inches water. Everything else was less so that was the number I went with. I collected all the data at this level then corrected the flow to 10 inches using the formula.

Corrected Flow = Measured flow X square root (10 inches / 5 inches)

This gave me flow corrected to 10 inches so that carb flow can be compared directly to heads flowed on the bench at that pressure.

		Run #	CV40	Run #	CV44	Run #	HSR42	Run #	HSR45
No AC		1	158.1	2	190.4	3	186.7	4	225.0
AC		5	159.3	6	191.7	7	186.7	8	220.3
Velocity Stack		9	NA	10	NA	11	187.9	12	225.0

Table 3 Carburetors on the Bench

There are no real surprises here. The bigger carb flows more air. One thing to notice is that the HSR42 almost equals the CV44. The HSR flows more efficiently per Venturi size because it does not have the butterfly that the CV44 has. I tried some different setups on the intake side to see if overall flow improved, no air cleaner, air cleaner and velocity stacks on the HSR carbs. It didn't make much difference either way except that the HSR45 lost some flow (run 8) due to the backing plate adapter. If using this adapter with the HSR45, I'd bore it out some to get that flow back.

The next test I wanted to do was with the manifolds by themselves. I could the see how much the manifolds effect flow of the intake tract. I originally planed on 3 manifolds, the stock manifold, a unmodified SE manifold and a late Super G with a spigot adapter. I'd purchased a SE manifold but also got one with the CV44 I received for testing. The head side of these measures about 1.610 to 1.620 inches. I figured that I'd open up the head side port to fit a 1.700-inch port and see how it performed.

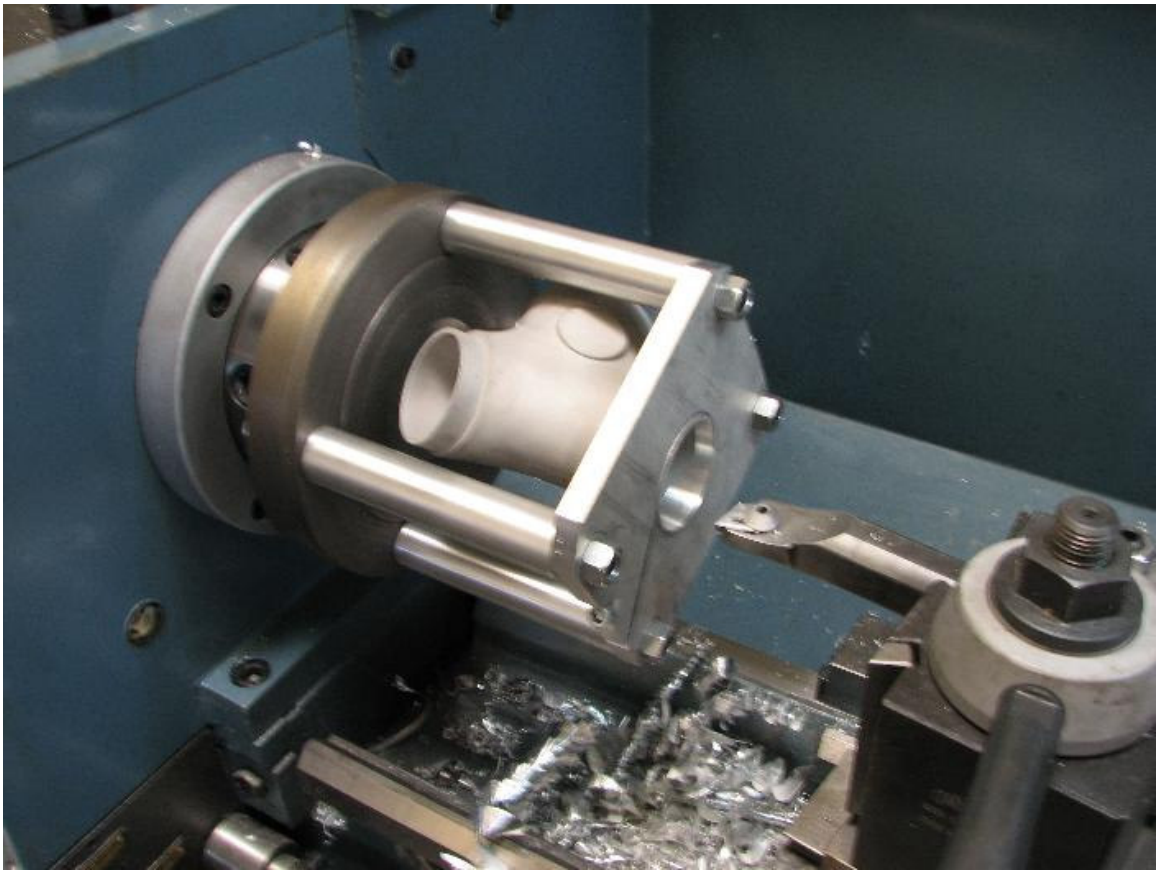

Figure 8 Boring the Manifold

I bored it at a 7-degree angle so that it was 1.700 inches at the end then blended the port to the taper.

Figure 9 Blending the Taper

With this done I flowed the manifolds on this fixture. I used the front head port to be consistent across all manifolds.

Figure 10 Manifold Adapter

I have a number of different port velocity stacks for testing head ports. I used these to see if the intake side was restricting flow.

Figure 11 Carb Manifold Testing

The test results show that on some intakes the stack helped and on some it made very little difference.

	Run #	Stock	Run #	SE 44	Run #	Bored SE	Run #	G with Adapter
Nothing	13	150.7	14	154.4	15	166.8	16	174.3
Velocity Stack	17	151.6	18	160.1	19	167.7	20	178.1

Table 4 Intake Manifold Runs

You can see that the SE and G benefited from the stack more than the stock manifold and the bored SE. I can see where the G would see the benefit but I'm not sure why the Stock SE liked the stack better than the bored SE.

Now that I've got flow on the individual parts, it's time to flow the carbs and manifolds together. Since the backing plate was common to all carb tests, I ran the combined tests with the backing plate.

Figure 12 CV40 on Stock manifold

Since the HSR45 and CV44 don't fit the stock manifold there are 14 runs.

	Run #	CV40	Run #	CV44	Run #	HSR42	Run #	HSR45
Stock	21	131.7	22	NA	23	142.1	24	NA
SE	25	127.0	26	139.3	27	142.5	28	150.7
SE 1.70	29	130.8	30	139.3	31	147.8	32	154.4
G with adapter	33	137.4	34	154.4	35	151.6	36	163.9

Table 5 Carbs on Manifolds

The numbers show some interesting results. For one, the CV40 saw absolutely no improvement on the SE manifold even if bored out. Those thinking that an SE manifold is going to help performance are probably not going to get much. I would venture to guess that some trying to port a stock manifold to gain performance is probably not get any increase in performance. The G manifold, which has a 1.80 head side port, flows way more than anything anyone would ever see on ported stocker and its improvement isn't that much. That statement does not mean a good port match doesn't have value but that issue wasn't the purpose of this test.

The next series of measurements that stands out are the CV44 versus the HSR42.. The 42 pretty much meets or beats the CV44 on a manifold everywhere except on the G manifold. The HSR42 made almost no difference going from stock CV40 to the SE and it still beat the CV44 on the stock manifold.

The G manifold is definitely a bit of overkill for the smaller carbs but it shows the limits that the smaller cabs can achieve. I think on all cases when using the G manifold with set of good heads I'd go with the 45. The 45 saw the greatest increase on the G manifold with 1.8 ports but you are getting into the higher performance head category.

Soooo,,,

There you have it, I would try to pick a carb intake manifold combination that works well with the heads you have. For optimum performance, I'm a firm believer in choosing an intake system that is checked on the heads you plan to use. If this is not possible, my next best choice would be to pick a carb manifold combination that flows say 7 to 10% more than the heads.

Munkey