ALL ABOUT ATCs

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3Wheeling

THE ALL TERRAIN VEHICLE MAGAZINE

PREMIERE ISSUE

INDY CHAMP RICK MEARS SHOWS YOU HOW TO RIDE SAFELY

BOLT-ON HORSEPOWER FOR THE ATC

A CLOSE LOOK AT HONDA'S NEW 185

PREPARING YOUR ODYSSEY FOR RACING

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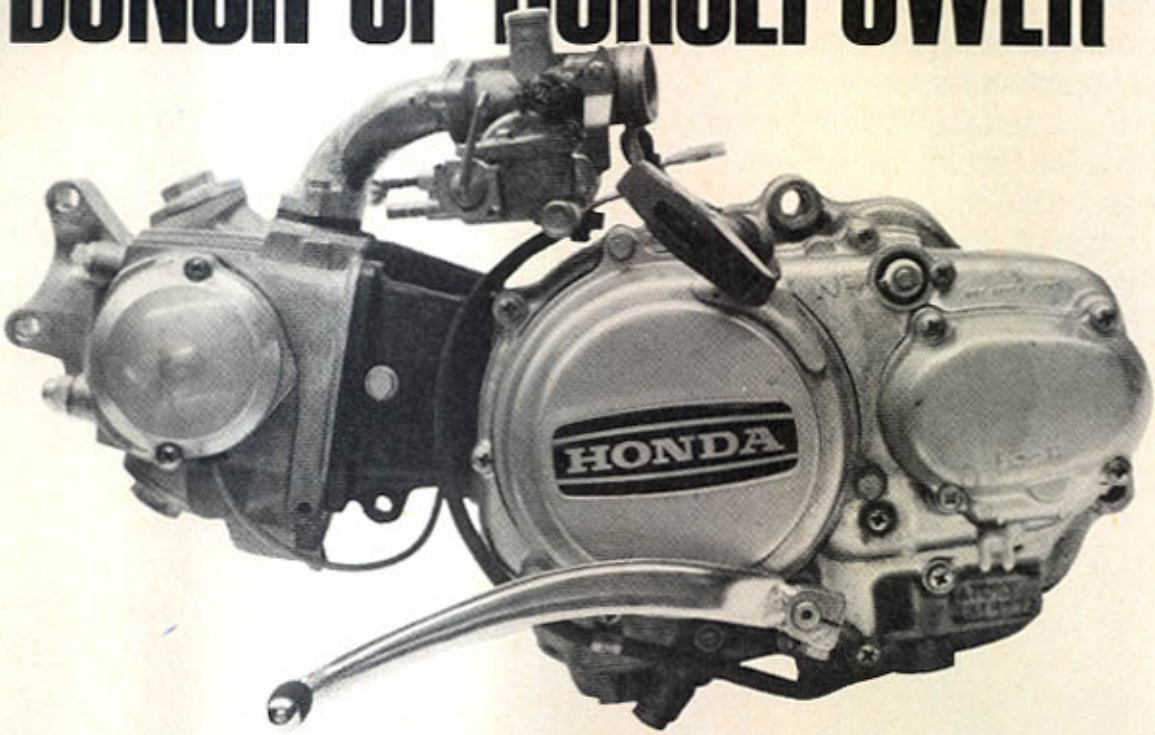
RETAILERS: SEE PAGE 97 FOR RETAIL DISPLAY ALLOWANCE PLAN

BOLT-ON A BUNCH OF HORSEPOWER

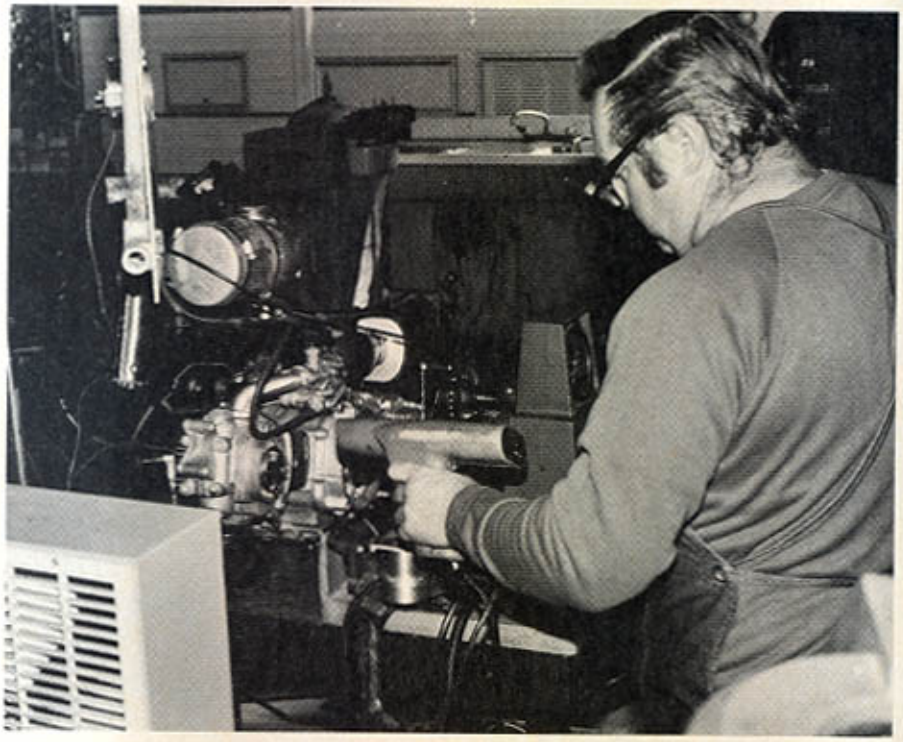
BY DEAN KIRSTEN

A DO-IT-YOURSELF WAY TO INCREASE ATC PERFORMANCE 56%



The Honda ATC 90 engine is one of the most durable and bulletproof engines that you'll ever come across. With normal maintenance and a tad-bit of common sense, the engine should last for years without the slightest bit of trouble. With a super modest 8.2:1 compression ratio, tiny carburetor and well muffled exhaust system, the 90 was designed to withstand just about any type of abuse imaginable. But, unfortunately, along with these safeguards to protect the engine, the amount of horsepower isn't exactly enough to rattle the fillings out of your teeth! Since many ATC owners demand more from their vehicles, bolt-on performance parts were born.

As you flip through our first issue, you have undoubtedly seen more parts and accessories now available for your three wheeler than you ever imagined. Just like you, we asked, "What kind of performance gains could the average ATC owner expect by doing his own work, using his own tools, in his own garage, utilizing bolt-on parts?" To answer this question we went to one of the most informed sources on ATCs–



ABOVE, the main man in ATCs, Danny Duncan is shown here adjusting the timing as per factory specs. We set the timing at the "F" mark throughout the dyno session. One point you might keep in mind is that the timing can be adjusted to aid the bottom or top end power to suit your needs.

the shop of Danny Duncan of Danny's Machine Works, 9184 Los Coches Road, Lakeside, CA 92040. There we found answers to these questions and hundreds more that we never thought of before! We discussed the idea with Danny about bolt-on parts and just what kind of increase we might expect. Since Danny's shop was complete in every phase of machine work, flow bench testing, and dyno facilities, we asked if he would help us with our testing.

The first order of business was to locate an ATC 90 engine with low miles and in good condition. After a bit of searching around, we located a used 1974 Honda ATC 90 three wheeler in great shape for $500. The trike was riden only occassionally and was perfect for our testing. The engine was removed, stock muffler and all, and delivered to Danny's. We next visited several parts manufacturers and located many of the more popular ATC engine pieces.

Before we get into the testing, we'd like to bring up several important factors. First, all 17 tests run were within a two day period, many of which were back-to-back (within minutes). Second, for all tests the ignition timing was set as per factory specs (with the breaker points opening at the stock "F" mark). Third, to insure that we had a constant and reliable fuel source, the helpful people at Reno Fuels, 6310 Federal Blvd., San Diego, CA 92114, supplied enough Daeco racing gas to get us through the session. For the record the gas we used was rated at 105 octane. Fourth, our dyno for this test was a Go-Power unit which was hooked directly to the engine flywheel. Readings from the dyno were direct in pounds, and to obtain a horsepower reading we had to multiply pounds times rpm divided by 2625. This was the formula given to us by Go-Power for Danny's dyno. So, with a good running engine, dyno, plenty of Reno fuel, a knowledgeable man, and a ton of parts to test, we were on our way!

TEST 1

For our first test we wanted to see what the 90 would do right out of the box. We used the stock air cleaner canister, and stock carburetor and muffler. The spark plug for all tests was a NGK D8HA gapped at .023-in. The points were gapped at .014-in., and as we mentioned before the timing was set at the "F" mark. The main or gas jet that came with the Honda was an extremely small # 64, which in our minds was way too lean. In fact during the first run the jetting was so lean that we were afraid extended periods of time under heavy dyno loads would harm the engine. So, for our first test we gave the engine a little help and replaced the jet with a larger # 75. The needle was then placed in the center position for all tests to act as a constant.

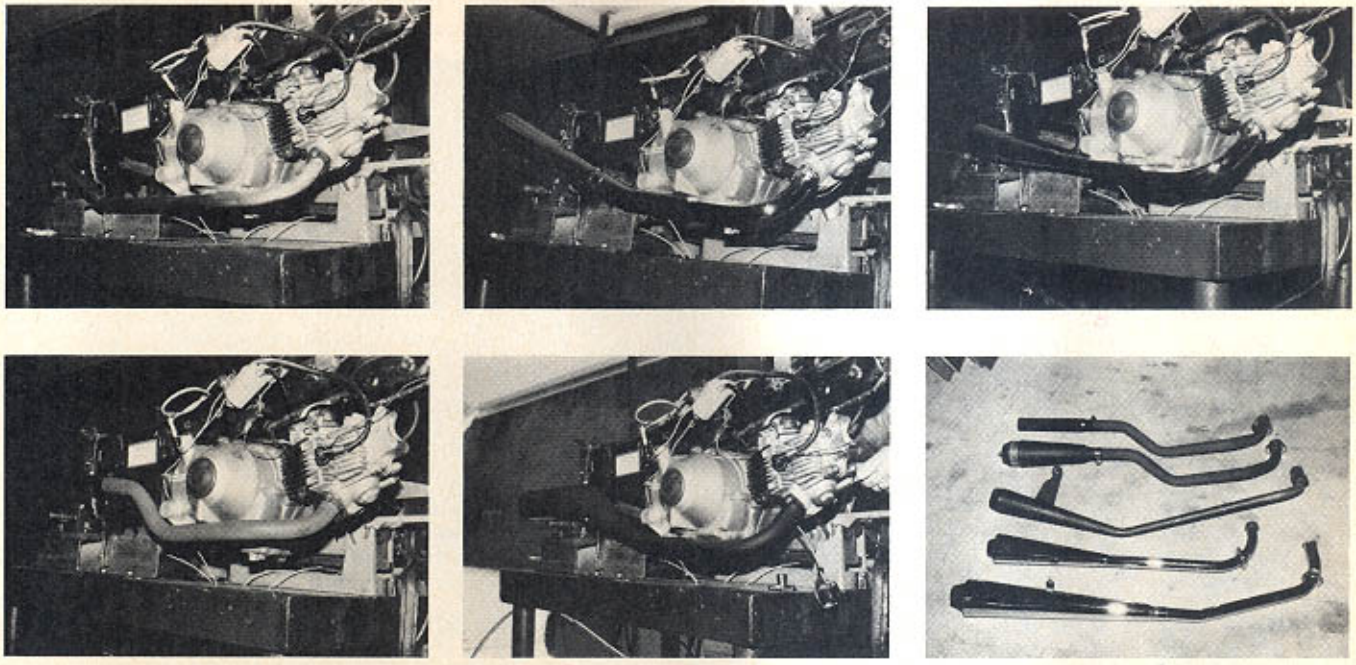
The first test netted a best reading at 5500 rpm which was 1.75 lb. If you were to compute that out it would show our engine had a peak horsepower of 3.66 at 5500 rpm. Shocking isn't it? We were surprised to say the least! According to the book, the engine is rated at 5 horsepower at 7500 rpm! Well, so much for ratings. The engine did pull at 6000, but fell flat at 6500. The cam seemed to come on about 3500 and best power was between 4000 to 5500.

TEST 2

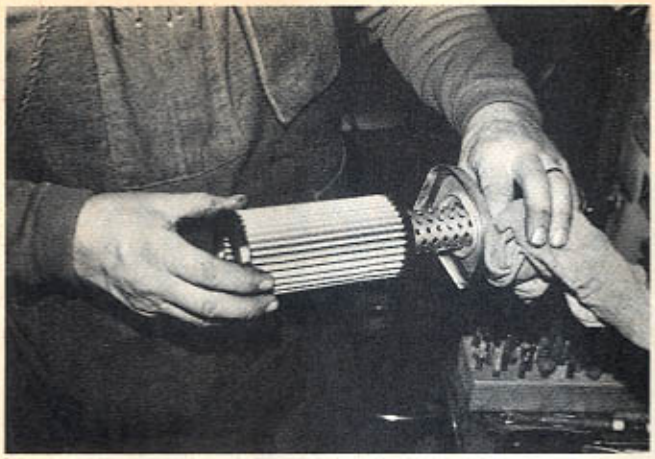
After test one was completed, a plug reading indicated that the jetting was still lean (remember the gas we're using). For test two we increased the jet to a # 80 and we started our first aftermarket parts testing by replacing the stock air cleaner canister with a K&N filter. The K&N fit perfectly inside the stock canister and test two was ready to roll. This time peak horsepower was at 6000 rpm, with a reading of 1.75 lb. or 4 hp. This may not sound like a lot, but in percentages that's over a 9% increase by just increasing the jetting and a freerer breathing air cleaner. The biggest news was that the engine really started to breathe at 6000 rpm as before it fell flat on its face.

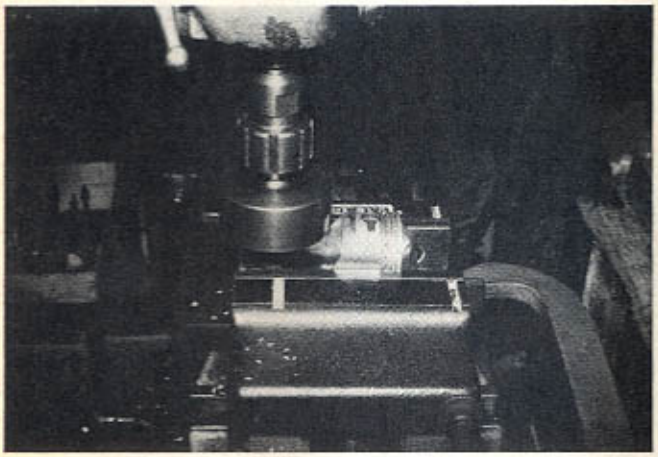
TEST 3

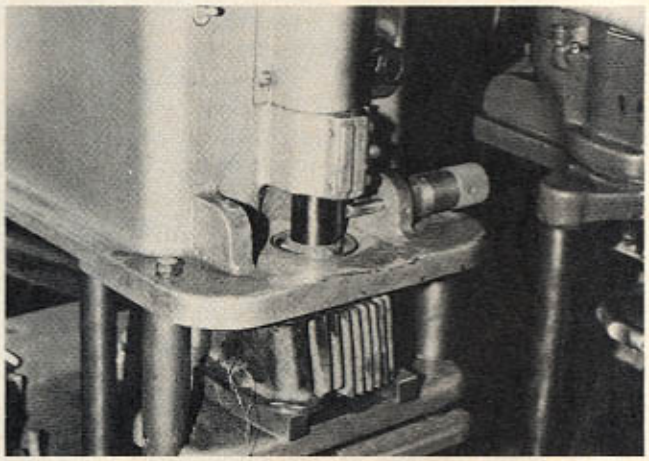
Our first exhaust system was installed and we used an S&S header. Right away the engine revved cleaner



ABOVE, the major part of our dyno testing was devoted to exhaust systems. Top left is the Hooker header, top center, the chrome S&S, top right is the chromed system from POSA Enter. LOWER LEFT, shows the Big Al's Stinger and the center shows the Bassani exhaust. LOWER RIGHT, shows a comparison between the Stinger, Super Trapp, Hooker, POSA and S&S from top to bottom.







TOP LEFT, in test #2 we replaced the stock air filter element with a low restriction K&N filter. This along with a jet change improved the performance by 9%. TOP RIGHT, without a doubt one of the best improvements you can make is by installing a big bore kit. For our 90cc engine we used a 54mm piston for a total of 106cc. LOWER LEFT, the only machine work operation necessary to install a 58mm stroker was clearancing the piston skirt. Piston can be ordered pre-clearanced for a bolt-on installation. LOWER RIGHT, the stock cylinder was bored oversized by 4mm to match larger piston. Once the cylinder was bored, Danny then honed it to size for a .0015-in. piston to cylinder clearance. A small chamfer is also placed on the lower side of the cylinder to aid in installation.

ENGINE RPM / HORSEPOWER	TEST 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
3000	2.17	—*	—	—	2.05	2.11	2.05	—	2.17	2.28	2.11	2.28	2.34	2.28	—	—	—
3500	2.60	2.33	2.40	2.40	2.46	2.46	2.4	2.46	2.60	2.80	2.60	2.73	2.80	2.80	2.82	—	—
4000	2.74	2.74	2.81	2.81	2.81	2.89	2.74	3.20	3.20	3.27	3.12	—	—	—	—	3.65	3.65
4500	3.17	3.25	3.34	3.25	3.08	3.25	3.25	3.68	3.68	3.68	—	3.77	3.80	3.68	3.73	4.37	4.37
5000	3.61	3.80	3.80	3.80	3.80	3.71	3.80	4.09	4.09	4.00	4.00	4.09	4.19	4.15	4.09	4.76	4.85
5500	3.66	3.98	4.08	4.19	4.14	4.08	4.08	4.19	4.40	4.40	4.50	4.40	4.60	4.50	4.50	5.23	5.34
6000	2.5	4.00	4.45	4.22	2.51	4.34	4.22	4.57	—	4.57	4.91	4.68	4.68	4.34	4.68	5.25	5.71
6500	—	—	—	—	—	—	—	—	—	—	—	4.20	—	—	—	—	—

DYNO TEST DATA

1. Stock engine with a #75 main jet.
2. Stock engine with K&N air filter & #80 jet.
3. Stock engine with S&S header.
4. Stock engine with Hooker header.
5. Stock engine with Posa header.
6. Stock engine with Super Trapp header.
7. Stock engine with Big Al's Stinger header.
8. 106cc engine with S&S header.
9. 106cc engine with Super Trapp header.
10. 106cc engine with Bassani header.
11. 106cc engine, Kenny Harmon #90 cam, Bassani header.
12. 106cc engine, Kenny Harmon #51 cam, S&S header.
13. 106cc engine, Web Cam #98, S&S header.
14. 106cc engine, Norris "S" cam, S&S header.
15. 106cc engine, Web Cam #98, 22mm Mikuni carb., #120 main jet.
16. 132cc engine, Web Cam #98, 22mm Mikuni carb., #130 main jet.
17. 132cc engine, Web Cam #98, 22mm Mikuni carb., #120 main jet.

* NOTE: (—) indicates no reading was taken at that rpm due to engine vibration.

and would go to 10,000 rpm easily (but not recommended). Peak horsepower was at 6000, 1.95 lb. or 4.457 hp. In percentages that's slightly over 11% over test two and over 21% better than stock. The S&S was extremely quiet and the engine seemed to run smoother.

TEST 4

The S&S exhaust system was removed and the second exhaust system was installed. This time we tried the system from Hooker Headers. Better readings were found at 5000 and 5500 rpm, but lower readings at other rpm were present. The system was louder than the S&S and fit the frame perfectly.

TEST 5

The third exhaust system was installed using the POSA unit. Sound wise it was slightly quieter than the Hooker and measured the shortest length of all systems tried. This pipe worked excellent at 3000, 3500, 4000 rpm, with a power range slightly shorter than the two previous.

TEST 6

Pipe four was installed using the Super Trapp system with 12 baffles installed. Noise was low and the power band was good from top to bottom.

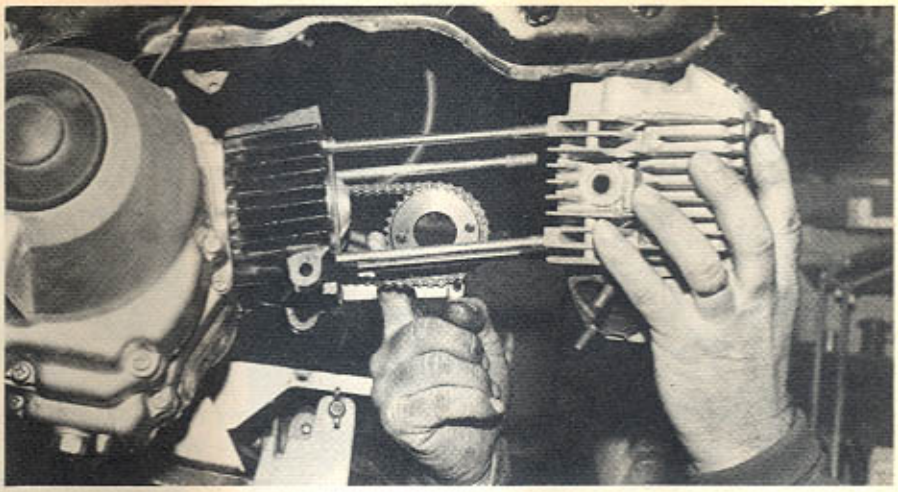
TEST 7

System five was called a "Stinger" from Big Al's Performance Products. The noise level was low and the power range was good at all rpm. Although it equaled the best readings, the engine didn't seem to run as smooth as with some of the others. A good point of the system was its compact size and lightweight.

TEST 8

With all systems showing almost equal power and a great 12% increase in performance already, it was time to move on.

Probably the most popular way to increase horsepower of an ATC is through the use of a big bore kit. Now there are many sizes and compression ratios available but for our purposes we decided to use the 106mm kit. What actually goes on here is the stock cylinder is bored 4mm oversized to 54mm, and this along with the stock stroke of 45.6mm, gives a new size of 104.43 or more commonly referred to as a 106cc engine kit. Many shops will sell these engine kits on an exchange basis. For instance, our piston came from Big Al's Performance Products, which included rings, pin, keepers and gasket. To bore our cylinder, Danny handled that easily. The entire kit is also available from Danny's ready to bolt-in. Over and above the larger bore, the Big Al's piston featured a raised dome which increased the compression ratio to 10.5:1. The 106 kit will bolt-in a 90cc engine without cutting the case or head.



TOP, in test # 8 we installed a 106 engine kit. Here Danny holds the cam gear with one hand and slips the cylinder head into place. If you look closely, you can see the raised piston dome. LOWER LEFT, cylinder head was torqued to 18 ft. lb. as per factory instructions. LOWER RIGHT, by centering the cam gear (Danny's right hand) along with the engine set at T.D.C, the cam was easily installed. Small locating pin on camshaft faces toward the front of the bike. Cam lube was used on all cams to insure proper break-in. The Norris, KH and Web Cam all showed a good increase in performance, about 11%.

We installed the 106 kit while the engine was still bolted to the frame (we have the type of frame that uses a removable front engine mount). It took about 30 minutes to install. Danny retorqued the head to 18 ft. lb., and replaced the stock cam and ignition. We reset the timing (stock) and replaced the exhaust system with the S&S header. Danny allowed the engine to break-in before we did anything heavy duty. After a few minutes of ring break-in, the engine, now a 106mm, showed a super 36% increase in power at 3500! Actual increase at 6000 was only 2.6%, but who cares with a reading like that at 3500 rpm! So far we've added about 25% more power at peak to the engine. It was now beginning to sound healthier.

TEST 9

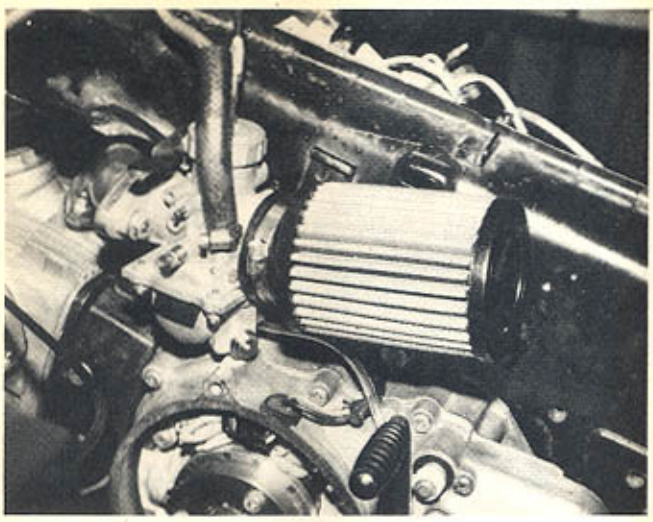
Just to give you a comparison of one exhaust system to another with a bigger engine, we reinstalled the Super Trapp with no other modifications being made. We did see a slight increase at 5500, but the engine wouldn't pull the dyno at 6000.

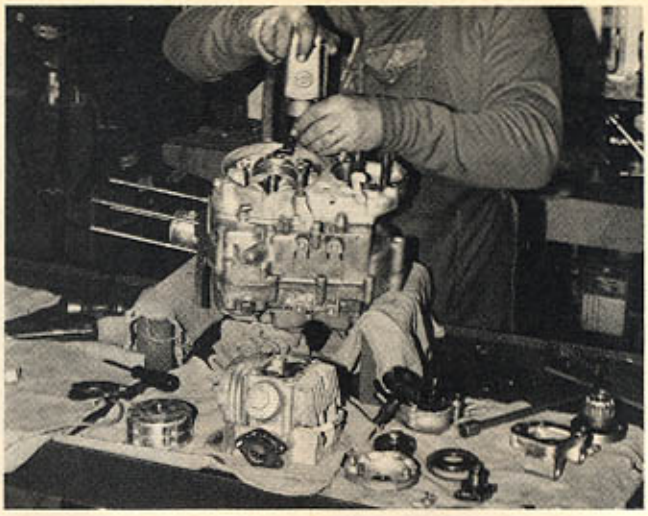
TEST 10

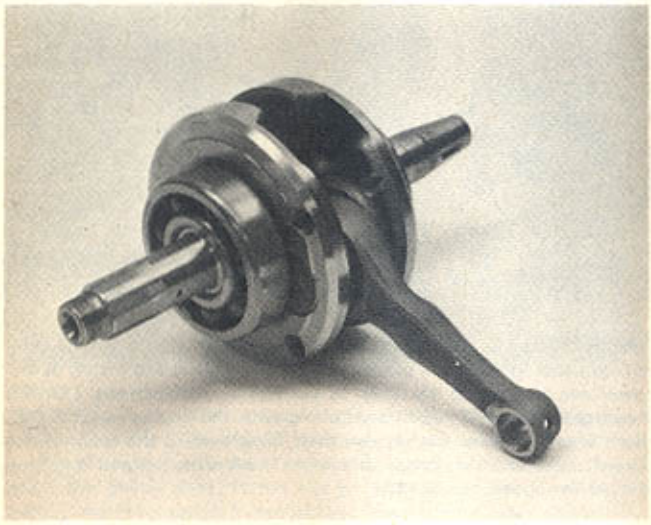
A late arrival to the test. The sixth exhaust system finally arrived. The popular Bassani exhaust or HP pipe was installed for testing. The Bassani was one of the quietest system tried and made slightly more power in the lower rpm scale than the S&S.

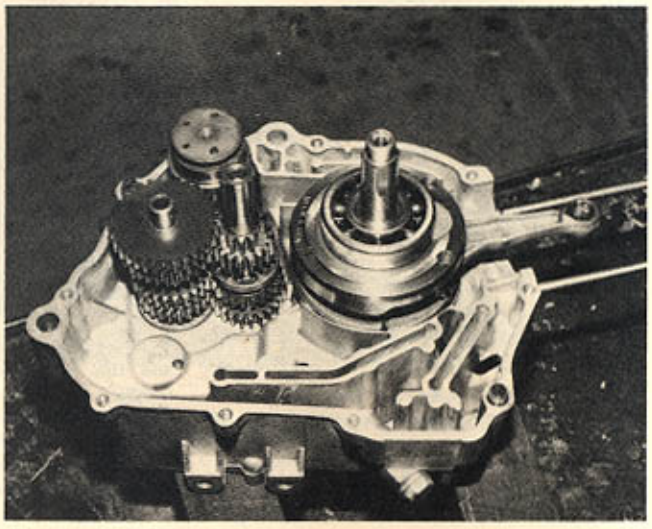
TEST 11

Amazingly enough, one of the easiest parts to bolt-on is the camshaft. Total time to install a cam and reset the timing was about 10 minutes. High performance cams of every shape, size, make and usage are available from one cam grinder or another. Without getting completely carried away, we narrowed our tests to three manufacturers. For









TOP LEFT, a larger carburetor was tried in test # 15. A 22mm Mikuni carb kit from POSA Enter. is shown in place on our 106cc engine. TOP RIGHT, before test # 16 was run, the entire engine was torn down for a larger crankshaft. LOWER LEFT, the 58mm stroker crank from Helm & Son was installed in our 106 to make it a 132cc. Crank was a bolt-in with no case interference. Crank features a "squashed" or short connecting rod. LOWER RIGHT, Helm crank in place. Gear's to the left of the crank are part of the ATC's transmission.

test 11 we used the # 51 grind from Kenny Harmon cams. The bump stick features .200-in. of lift (at the cam) on the intake with 306° duration, and .197-in. of lift and 288° duration on the exhaust. The KH # 51 showed a good increase in mid to top end power, with the cam coming-in at about 3800 rpm. Peak horsepower was at 6000 with a reading of 4.91 horsepower. That's over a 7% increase in performance or a total so far of 34%.

TEST 12

With the Kenny Harmon cam still in place we replaced the Bassani system with the S&S header. Horsepower varied ever so slightly throughout the rpm range with no significant improvement.

TEST 13

We removed the KH cam and replaced it with a Web Cam # 98. The Web # 98 showed a gross lift of .221-in. for both the intake and exhaust valves. For duration, it measured 280° at .010-in. lift. Valves were set at .004-in. The Web cam showed an excellent power curve. Mid to top was identical to the KH cam with slightly better low end.

TEST 14

The third cam installed was a Norris Cam "S" grind. The "S" features a lift of .255-in. for both lobes measured at .020-in. lift. Intake valve was set at .002-in. and exhaust was set at .003-in. Timing was reset and the engine fired. The "S" showed good low to mid range power, equal to the KH cam, with a top end slightly less than the Web # 98. One point that we would like to bring out is that we are working with very small amounts of power increases. We seriously doubt that the average ATC rider could tell the difference between one cam or another. The point is that they *all* give a good increase in performance, and for the money (about $40) we got an 11% increase. Also, all cams seemed to come in at about 3800 rpm, which created a surge point in torque. For all three cams we were unable to take a reading at 4000 rpm because of this. The fact that no reading was taken doesn't mean they weren't making power.

TEST 15

For test 15 we reinstalled the Web # 98 cam and the S&S header. For this test we installed a 22mm Mikuni carb kit from Posa Ent. The kit comes complete with manifold, gaskets, and hardware. It installed in a short time although we did have to clearance the engine case, however nothing major. It fired right up and idled like a stocker.

From Posa, the carb was jetted with a # 150 main jet. This proved to be way too large for our 106. After a few trial tests, we ended up with a # 120 main to obtain our readings. According to the dyno tests, at this time the 22mm Mikuni seems to be a little large for a 106cc engine (like ours). Possibly with head work or larger cam it might be just the ticket, but for now a 20mm carb may work better. A horsepower increase was not present.

TEST 16

Now we're ready for the biggie! We removed the engine from the dyno and completely disassembled it to install a 58mm stroker crank from Helm & Son. The 58mm crank along with the 54mm bore would give us a grand total of 132cc. The Helm & Son crank is a bolt-in, there is no clearancing or cutting necessary. The only modification needed is to clearance the piston skirt for the larger stroke. This proved to be a simple operation for Danny with a few cuts on the mill, and we were ready to install it. Although this was the only non-bolt-in operation performed, a 106mm piston can be ordered from Danny's or other shops pre-clearanced for a 58mm stroke.

The crank was dropped into place, and the engine was then assembled using gaskets and seals from Big Al's Performance Products. Once the engine was assembled, we installed a case saver to protect the case from damage in the event of chain breakage. To use a high powered headlight on a three wheeler, as we plan to, we had Danny install a high output stator from Big Al's. Finally and very important, with larger cc and higher compression, we installed a Big Al's case breather to help remove internal case pressure.

For engine lubrication we used Bel Ray 20-50 wt., 4-Cycle Racing oil to keep things cool and calm on the inside. Bel Ray is just the ticket for ATC engines–stock or full-tilt.

The engine was reinstalled on the dyno and the timing reset. Parts wise we were now using a Web # 98 cam, S&S header, and a 22mm Mikuni from Posa. With a # 130 main jet the engine woke up like nothing we've seen so far. Power from the 132 was dazzling, the engine showed an increase of 17% at 4500, 16.27% at 5000 and 12.19% at 6000 rpm. Peak horsepower is now 5.25 for a total increase of 44%.

TEST 17

With everything the same as in test 16, we rejetted the carb to a leaner # 120 main and found that last bit of power. Peak power stayed at 6000, with a best of 5.71. That's a total increase in peak horsepower from stock of 56%! Bottom end power was increased by 33.2% at 4000 also. Now, 56% might not sound like a bunch, but imagine if you were to increase the power in a VW from 40 to 62, or how about a 350 hp 327 Chevy to 546! Get the picture? A 56% increase in power in your ATC will certainly allow you to climb steeper hills and go places you'd never dreamed of before, and the best part is that you can do-it-yourself!

CONCLUSION

Just a few quick notes about the test. With the amount of equipment now available, the combination of cams, carbs, and exhausts is almost endless! The point we're trying to make is that you, the do-it-yourselfer, can increase the performance of your ATC by 56% or more, by doing your own work. By getting a good repair manual such as the Clymer or Haynes, or the Honda repair manual, and a few tools you can have it covered. Dickson Design in National City, Calif., manufacturers several tools to make working on the ATC a heck of a lot easier, so you might give Bob a call.

We'd like to thank all the people that made this session possible, and special thanks to Danny's Machine Works for their time and expertise. Next time we'll get into larger engines, head work, bigger cams and even try some super trick ideas that are now being experimented with. Until then, safe riding! ●

Important names and addresses we mentioned in the story. When you call or write, remember to tell them you read it in 3 Wheeling magazine.

Big Al's Performance Products
155 W. 35th St., Suite A
National City, CA 92050
(714) 426-6520

Danny's Machine Works
9184 Los Coches Rd.
Lakeside, CA 92040
(714) 443-2880

Dickson Design & Development
155 W. 35th St., Suite A
National City, CA 92050
(714) 425-8551

Helm & Son
21 South 36th St.
Phoenix, AZ 85034
(602) 275-2122

Kenny Harmon Cams
4901 Morena Blvd.
San Diego, CA 92110
(714) 483-1051

K&N Filters
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Riverside, CA 92502
(714) 682-8813

Norris Cycle Products
1711 N. El Camino Real
San Clemente, CA 92672
(714) 492-8585

POSA Enterprises
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Paramount, CA 90723
(213) 634-3412

Reno Fuels
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San Diego, CA 92114
(714) 286-3641

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Costa Mesa, CA 92626
(714) 546-8635

Web-Cam
1663 Superior Ave.
Costa Mesa, CA 92627
(714) 631-1770

ABOVE, during all tests run on the ATC 90 engine, Bel-Ray 20/50, 4-cycle Racing Oil was used. The ATC engine takes one quart of oil to reach the full mark. Nice looking polished side covers came from Johnson's ATC in Santee, Calif.

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