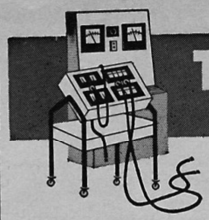
Best to be read in combination with the article on a Road Test that can be accessed at:

www.healey6.com/Technical/road.pdf



TUNE UP CLINIC

by Bill Corey

CONTINUING our remarks from last month about the Austin-Healey, all the engines are basically similar, and adding a LeMans kit is not as difficult as it might seem and can certainly be accomplished within the price differential of the two latest models. If you are interested in learning how this can be done, pay close attention, for my shop recently modified a Healey at a surprisingly moderate cost, and we were most gratified to achieve more rear wheel horsepower than the price charged seemed to justify!

Our first step was to remove the engine from the chassis and to disassemble it completely. The crankshaft, flywheel, clutch and crankshaft pulley were balanced electronically to achieve perfect static and dynamic balance. When this was done, approximately eight pounds of surplus metal was also removed from the flywheel. The only effect the lighter flywheel seemed to have was a slightly rougher idle and some faltering in getting off of the mark if engine rpms were allowed to drop too low. At all normal speeds, the engine was far smoother than before, and it is my personal opinion that a large four-cylinder engine such as this benefits greatly from accurate balancing. New pistons were installed, which were made up specially with a compression ratio of 9-to-1, and piston pins and connecting rods were all matched for weight. Pistons were fitted wih a clearance of .005". Main and connecting rod inserts were maintained at standard factory specifications. Two compression rings and one oil ring replaced the standard four ring set-up and the compression rings were exceptionally narrow to eliminate flutter and possible loss of compression seal at high rpms.

From the beginning, we felt that the stock camshaft left much to be desired. Even with standard compression ratio, the piston displacement-to-weight ratio is quite favorable, and the car certainly does not suffer from lack of low speed pulling power. It was my opinion that the new 9-to-1 pistons would permit a considerable change in the mid-range torque characteristics of the stock cam. For this reason, a so-called "full race" cam was decided upon, with stock lift but of considerably longer duration and overlap. Surprisingly enough, the final dynamometer tests showed little change at low speed but a remarkable increase at the top end of the rpm range. This new camshaft, combined with the breathing improvements listed below transformed the rather docile, uninteresting engine to a fire-breathing, Jag-chewing powerhouse!

Needless to say, the manifolding was cleaned out thoroughly and polished to resemble chromium. Both intake and exhaust ports were matched to perfection and the combustion chambers received a like polishing treatment. All radii were carefully blended and extreme care was taken to eliminate conditions in the manifold and cylinder head which would cause sudden changes in velocity. The valves, however, were left stock with a small amount of metal removed from the heads to achieve a tulip shape, and the seats were narrowed as much as consistent with a gas tight seal. Valve gear received loving care and each rocker arm was carefully polished and the complete set matched for weight. The push rods were also carefully weighed and matched and a small amount of metal removed to gain a slight advantage at critical valve bounce speed. Valve springs remained stock. They were, however, carefully

matched for tension and, believe it or not, matched for weight!

I can visualize some shaking of heads when I state that carburetion remained stock. We attribute our good low-end torque to this fact, and simple venturi-area calculations will show that the equipment carburetion on the Healey is quite adequate to serve breathing requirements at any speed of which the engine is capable. It was necessary, however, to fabricate special needles to match the other modifications correctly, and a cool air intake with a remotely mounted air cleaner added some four horsepower under high temperature conditions. It was also necessary to tailor the advance curve of the distributor to match the new compression ratio and the higher speeds of which the engine was capable. Carburetion and ignition required a lot of hours on the dynamometer, and one of my conclusions was that it is certainly a pity that engine dynos are not more widely available. I am always somewhat skeptical of the comparative figures achieved by rear wheel measurement, particularly when one is at the mercy of small rollers and the changing friction coefficient of rubber-to-metal at high temperatures.

Most authorities feel that a dual exhaust system is not needed on a four cylinder engine because of the wide spacing of firing impulses. It is my contention, however, that high output engines definitely need a dual system. Upon consideration, it will be realized that, as an example, number two cylinder is on top dead center, starting the intake stroke when number one cylinder is on bottom dead center starting the exhaust stroke. With anything more than very mild valve timing, this means that the exhaust valves on both cylinders are open at the same time with the pressure differential to the disadvantage of cylinder #2. Since a certain amount of back pressure is a necessary evil with mufflers designed for street use, cylinder #2 can never obtain a full charge of fresh mixture unless it is divorced from #1 by a dual system which ties cylinders 2 and 3 together and divorces them from 1 and 4.

This theory has been borne out in my practical experience a number of times and, in the case of the Austin-Healey, the dual header system which we made up for the car did as much as any other single modification to increase output at maximum rpm. A dual system is certainly not an easy job to install on a Healey, and I would hesitate to recommend it, unless I were quite sure that the results would be worth the cost.

The sum result of all the modifications we made to this engine amounted to an increase in horsepower at the rear wheels of some 41%. Ordinarily, if we are able to modify an engine to achieve as much as a 20% increase we feel indeed fortunate, so it is easy to see why we were quite gratified about what could be done to the Healey if cost were no object. And, speaking of cost, the owner spent $750.00 for this kind of performance. Considering the fact that he now has only 20% less horsepower at the rear wheels than a well tuned "M" type Jaguar, but is driving a car which weighs 40% less, he is quite well satisfied with his investment! ●