1987 VW 16 VALVE TURBOCHARGER DEVELOPMENT PROGRAM

CALLAWAY ENGINEERING
3 HIGH STREET
OLD LYME, CONNECTICUT 06371

TEST PERIOD: May, 1987 thru June 17, 1987

TEST GOALS: The purpose of this test series is to develop a high output production based engine for use as a race pace vehicle for VW and at the same time to evaluate this vehicle for kit based packages for customer use in this vehicle (1987 VW GTI).

TEST ENGINE: The engine used for development in this program was a four-cylinder 1.8L fuel injected gasoline engine used in the GTI model. It was supplied to Callaway Engineering by VW in a crate and represents an actual production piece. There were two specific engines used in this program. The first was supplied as above from VW. That engine lost performance on the dyno and was replaced with a unit taken from a vehicle on site at the Callaway facility. It was this second engine, which was used for final development and fitted into the auto for final in car testing and delivery.

TEST LIMITATIONS: The duration of the tests was held to a period of four weeks at this facility where a total of 131 individual tests were performed to evaluate the performance of the standard and the modified production engine. It is of course possible to increase the performance even more through additional testing and development, however the goal here was to provide the greatest amount of performance within the test period while using as many production pieces as possible.

The total electronics package was used as supplied by VW in this setup. This presented a problem with relation to the ignition curve present in the electronics package. With the turbo kit it was felt that the total ignition timing (which was 30 degrees at maximum lead) could be reduced to allow for the increased cylinder pressure generated by the turbo system. This problem led to the use of 100LL octane fuel in the dyno application in order to reduce the tendency to detonate even though the compression ratio had been reduced with the kit package.

TEST PROCEDURES: At the start of the program the engineering staff evaluated the engine compartment for the room necessary to complete the required installation. After this process decisions were made on the routing of the important added components of the entire system. An initial dyno mock up was made which included the turbo size, intercooler location and size, microfueler location and size, exhaust manifold construction, oil cooler size and location, and the routing of the various hoses.

The base normally aspirated engine was placed on the test stand and evaluated thoroughly before the turbocharger system was even employed. When a reasonable understanding was obtained from the baseline engine, the turbocharged engine parts and accessories were installed to the test stand engine. Through our many years of research into turbocharger applications it is possible to place a system on the test stand and with a small amount of work, generate more power and torque. This, however, is only the start of the real work.

It was known at the start of the program that there was a problem with the fuel delivery to the engine. At approximately 5000 RPMS the fuel flow would take a dive and recover slowly. It was thought that there was a major problem with the electronics. After much testing and with phone conversations with VW to determine the problem, it was found that several critical connections were not made which limited the fuel delivery at that RPM area.

In this present configuration the boost level of the engine was limited to 12 psi. We feel at this time that this is the safe level of boost to remain at keeping in mind the intended use and the fuel, which is available. Remember that this entire package is designed as a SYSTEM and any attempt to change a portion of the entire designed system would meet with unfavorable performance or possible engine damage. The boost level currently employed is mated to the fuel system capability.