Lessons Learned on rebuilding the Air Cooled 1600cc

By Dale Mueller, Klamath Falls, Oregon

The reason for this [article] is to try to encourage others not to be afraid to attempt such a project.

A couple of years ago I found a Type 181 to restore. I had previously owned a '68 Ghia, which was my daily driver for abut 15 years. About 10 years ago I was forced to build an engine for the Ghia as it had eaten #3 exhaust valve like ALL improperly cared for air cooled's will do. By dumb luck the engine is still running.

13 years later I purchased the Type-181 and not realizing the differences in the engines in the recent years… my Thing had a non Thing engine of unknown origin which lasted less than as week. I pulled the engine and installed my Ghia 1500 in my Thing as it had become my driver. At this point in time I decided to build the proper engine for the Thing. All I knew at that time was that I needed a type-2, or a universal case. As I was on the Thing list at the time I wrote Martha (Busgirl) asking some information on buses as I had had the opportunity to acquire a donor bus for parts. Martha was kind enough to inform me about the Type-2 list, and here I am. I have been able to glean the necessary knowledge from the Archives, Sermons and the kind hearted listee's to build a great engine.

Rather than a blow by blow of the rebuild I think I would like to approach the subject as to what I learned and some of my mistakes and troubles, thus helping someone else.

I had two major challenges, the first was, the engine I was building was for a '73 Thing which had had a bunch of "one year only" cooling tin. The second challenge was that I wanted a DP/doghouse cooled engine. I had never been around late model VW's so had never seen what I was trying to build. I live in Southern Oregon in what a lot of people consider a "cow town". I do believe that without the Internet and the Type 2 list I could NOT have accomplished my goal. So, Mister or Ms. Newby [ ]… If I can do it YOU can do it too.

My VWFLAPS is 2 hours away over a mountain pass, which is sometimes problematic in the winter. I was able to acquire my "Thing only" tin from Kubel Ken and the other tin from junkies from Portland to Sacramento. I obtained other parts by trading with listees from the Type2 list.

NON-STOCK CHANGES:

- ✯ Engine was fully balanced both by weight, and volume with the rotating parts balanced as a unit.
- ✯ Installed counter balanced crank
- ✯ Valve seals, I am trying Teflon with metal spring clips to see if the performance is improved.
- ✯ Installed a full flow oil filter. I decided to go with a Berg as I live in a cold climate and wanted the protection of a relief valve at the pump output.
- ✯ Sand Seal with filtered air inlet. This modification is still under testing. I am not fully satisfied at this time that I am getting enough flow. More on this when I have time to mess with it.
- ✯ VDO Oil Temperature Gauge, I purchased a VDO temperature sender with 1/8 npt threads that I inserted into the side port of a tubing tee to measure the temp of the oil at the output of the filter.
- ✯ VDO Oil Pressure Gauge.
- ✯ Installed swivel foot valve adjusters.
- ✯ Had all cooling tin powder coated.

Not a ripple at 3000 RPM
Photo by Dale Mueller

THINGS THAT I LEARNED:

- The balancer did a sloppy job on the pistons, I was able to borrow a balance scale and double-check him. He was over 1.0g heavy on two pistons… I fired up the Dremmel and got them all within .02g.
- I had a pair of DP heads from a donor Bug that were in real good shape… I was able to replace 4 valve guides per the Sermons with no problems. I had the heads beaded and the seats ground. I then lapped the new valves in; CC' d and put them aside. More on these heads later under "mistakes I made".
- Before putting your rings back on take a fine Arkansas stone and stone the gap edges to removes the burrs.
- Valve cover Gaskets…be sure that the seal surface on the heads is smooth. If it isn't use a mill-cut file to smooth it as well a cham

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fer the edges both inside and out. Ok to pre-bond the gaskets to the cover but no sealer on the head side.

- To fit the cylinders to the spigot bores put chalk or lipstick on the spigot bores and give a slight twist. Check for minute dings.
- To install cylinders put the sealant on the cylinder and NOT the spigot bore.
- "New" does not mean "correct" I put several hours into grinding the castings on the "new" heads as the air passages were for the most part plugged. The Universal Crankcase was also very rough from casting… several more hours here with Mister Dremmel. (Fun part… save the shavings and have some fireworks)
- DP heads require different stud lengths. Job held up waiting for studs… Thank you Jim Thompson
- All DP cylinder tin is NOT equal. See "Mistakes I made"
- The oil cooler needed insulation (does not show in parts list)
- I became acquainted with the sealing frame AKA the "Hoover Bit". I was able to borrow one from a listy and fabricate my own. I am in the process of scanning the details to make it available to anybody who is interested.
- DON'T buy Taiwan after-market ANY DAMN THING. I had purchased a Taiwan alternator stand with Bosch Alternator and it was untrue. After losing well over a week trying to get it machined, I tossed it and found a VW stand for $20 at the Junkie's. It fit perfectly the first time. If you doubt what I am saying, just take a CLOSE looks at the after-market tin and compare it to old VW tin.
- You might have to grind the rocker arms about .060 to allow clearance for the swivel foot adjusters
- I had to add about 20 ohms resistance in series with the oil pressure sensor lead to correct gauge calibration as compared with my test gauge.
- The "shorty" fuel pump that I installed to clear the alternator has reversed inlet and outlets (discovered on test stand when trying to startup engine)

Dale Celebrating a job well done.
Photo by Eva Mueller

TOOLS I FABRICATED:

✯ Engine Test Stand Wrist Pin remover per/Sermons (for tear down of donor engine) Main seal installer Dial Indicator bracket for endplay measurement Plates for deck height measurements Piston ring compressors, 4 each

MISTAKES I MADE:

✯ The heads that I mentioned previously… Well would you believe I had not even considered what size engine they came off of? I was blinded as all I looked for was that they were DP and in good condition. I went to fit them to the heads and the bore was about 5mm too big. Back to VWFLAPS and $250 poorer I had new Brazil heads. (See back to what I learned RE: "rough castings") I had several hours into pulling the valves, lapping, and grinding the casting.

✯ Wrong cylinder tin. After doing some research on the net. I was assured by some that DP cylinder tin is all the same. I picked up some good tin from a junkie and didn't pay enough attention to the shape of the tin. I had the engine tested, broken in on the stand, and installed in the car and then realized that the tin was 2" too wide to fit the opening. Come to find out DP tin for FI is larger. I pulled the engine again, trimmed the tin and pop-riveted two strips of aluminum angle for an edge. IT looks real good but I will get the right tin when I can.

✯ Timing… I had the engine properly timed previous to startup. On startup day I thought I would recheck. As I was cranking the engine and observing the valve operation the GMG (Great Mechanic God) put a hot coal in my eye and it looked to me like I had the timing wrong. I proceeded to retime the engine totally screwing it up. After taking a good look at the situation I out the timing back where I had started and the engine fired right up (Bob H, this was the one I didn't want to talk about)

WORDS OF INSPIRATION FROM BOB HOOVER:

✯ "These seemingly unimportant details are really important. What you are doing is building in the durability of your engine… not adding something on. Think of it as an investment, a penny savings account. YOU are NOT an assembly line. You have time on your side… there is no reason for you to accept a lesser standard of excellence."

✯ "While I try to keep a fairly tight clearance throughout assembly, I always leave the decision up to the engine… a properly built engine has a certain feel. The crank spins with light finger pressure, the rods drop with a slow stately grace, the wrist pins oooooze through the little end bushings like molasses in January, valve stems cant just a certain way when tested in their guides… There are numbers associated with all of these things and I always start with that but numbers alone are not enough"

✯ "Assembling an engine is a bit like child-birth in that the presence of new "life" tends to erase the painful details. If you can, I urge you to put down those birthing pains in all their painful detail, and once the engine is broken in, post them to the list. There's no dishonor in honest mistakes and much stature to be gained from sharing them in hopes others might avoid them"

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In closing, I sincerely hope that my experiences have helped someone else. If I just can help one person I would feel that writing this is worthwhile.

I also wish to publicly thank Bob Hoover, Ron VanNess, Mike West and several others on the [Internet Bus List] who were so kind to answer questions and exchange information during the project.

[I wish to add a final touch to these ramblings. My intention has been to give encouragement to fellow Type 181 owners and show by example that building an engine is a worthwhile project and CAN be done by most anybody that has the guts to try. The tack I have taken is to let my mistakes be aired so that others could benefit by them. Yes, there were problems, waiting for this part and that part and a few SNAFU's in between. I consider the engine a total success. I made a trip of nearly 1000 miles to the Spring Thing Fling in Shelton, Washington and the engine performed very well. My MPG was averaged at 23, Speed 65. Until you witness first hand, a properly built well balanced VW engine yourself, you would not believe how smooth they run,]

Cruising up the back roads with the new motor humming. That's Mount Pitt in the background. Photo by Dale Mueller

I am planning my next project already, even though it will be the year 2000 before I tackle it. I have two old engines to do first aid to first.

Dale Mueller