

DIY guide to headwork

Here is what I would do (bearing in mind I have 200bhp N/A tuned engines)

1. Don't increase size of ports.
2. Most of the increase in flow is achieved by making the air/fuel go round the valve stem and seat faster the port has very little if next to no effect
3. None of the ports need polishing not even the chamber they all get covered in Coke and soot no matter how highly polished they are, they should just be smooth to the touch but there are some exceptions.

Part 1. Fuel injected direct port injection inlet manifold and all the inlet port before the injector should be super smooth as no fuel mixing occurs before injector air flow needs to be the best it can, this also means flowing and machining parts of the Throttle body, plenum, and runners the inlet manifold that CKE has is a pretty good choice nicely made with excellent trumpet shaped runners.

Part 2. If Injectors are further up the inlet manifold or are placed on the trumpets on some ITB's and with using Performance carbs, the finish of the inlet manifold from carb into port or injector into port should be of a slightly more rougher feel, although machined edges and cast defects should be removed and blended into the walls and throat of ports. You can start off with a rough finish at the end nearest the injector carb with it gradually becoming a bit smoother towards the valve seat or you can just have a relatively rough finish all round up to you make little difference. But all parts and walls should be super smooth before the carb or injector still.

A rough finish would look similar to running 500-800 Grit paper on a sheet of Ally
A smooth finish would be like running 1000-1500 Grit paper on a sheet of Ally

4. Inlet and manifolds should be matched perfectly if possible only way to do this is to flow it with the inlet manifold attached this can normally only be done if your using Weber DCOE's or ITB's, if it cannot be matched if your using plenum the inlet port outer edge should be rounded off like a trumpet or bellmouth so that it covers the whole of the diameter of the inlet port manifold, exhaust headers should have the header ports larger than the diameter of the exhaust head ports. The idea is to remove any flat 90 degree edges that may hinder airflow, removing them is essential even if it's is just .5mm or 1mm out should be completely blended in or rounded off so it has minimal impact.

Single Throttle Bodies can also be tweaked, the intake that joins onto the ducting can be smoothed out, polished, and the edge knife edges so that there is no lip to when

the Throttle body joins onto the piping of your CAI tubing, the butterfly can also be knife edged to help increase airflow past it, and the round head screws in the butterfly spindle can be pulled out and countersunk screws fitted in and ground flush with the spindle to help increase airflow past the butterfly and spindle also, if your feeling really extreme you could cut half the spindle off but only do this if the spindle is really chunky and well built. Matching the TB to the Plenum also and just making sure that the inside of the port into the plenum is nice and smooth also and that the gasket doesn't stick into the air way to hinder flow. Removing any heated pipes to the TB and inlet manifold will help keep temps down and a heat proof inlet manifold gasket will help keep things even cooler, only good for summer if your county gets very cold then you will have to leave it as stock.

On carbs and ITB's make sure that they are matched to the inlet manifold again the inlet manifold that meets the carburetor end can be trumpet shaped or bell mouthed or blended in perfectly depends how much metal you can remove and whether your going for torque or BHP narrow ports more air velocity more torque bigger ports lower torque more revs and top end BHP.

5. Working on the valve throat and seat area has the most gains as the machined edges are normally the worst and most heads have only one seat or a poorly cut 3 angle seat.

Remove the machined edges by blending them into the throat walls, no more is needed than to just make it smooth curve don't go making it bigger think this will help you want to keep the size of the throat and the area around this as small as possible.

Next concentrate on the area around the valve guide here on A20 nothing to worry about as the guide doesn't stick out the port roof although the roof has nothing in front of the guide which doesn't help, you can have it welded or leave it as it is welding will only gain you maybe 5-10bhp and you'd have to be running some serious mods to see the gains something you would do if you were building an all out race motor.

Next have 3-5 angle seats cut and have the valves matched to the seats with back cuts done too, you can leave it as it is or take it couple of steps further by smoothing of the edges caused by the seat cuttings on both head and valve, then there's also the finish of the valve super smooth polished or swirl effect which can be done on lathe with a rough finish grinding stone tired both seem about the same, I think with a direct port Injection system go with rough finish on a carburetor or ITB setup go with super smooth finish.

Exhaust Port is different though, the guide ramp and guide protrude badly into the port throat best mods to do is to completely remove the guide and the ramp that sticks out into the port or the race head way would be to turn the ramp and the guide into an aerodynamic fin that helps split the exhaust gas more smoothly around the

valve stem the latter of the two takes a lot of time, skill and some precision dremel bits that cost a fair amount again this would only be done on a race head or someone after that last 5bhp that can be squeezed out.

6. Combustion Chambers should be very smooth finish and the valves should be given as much room to breathe as possible, so I tend to match the chamber to the bores to open them out a bit helps with ignition timing and preventing detonation. Then I make sure that all the valve seats that have been cut are flush with the chamber roof any kind of edge will hinder airflow going in and out of valve. This can be done by using an old valve and using some tiny dremel bits to go around the valve using it as a guide to blend in the edges to the roof.

7. When all the work is completed and you've finished the chambers have the head skimmed and then thoroughly cleaned by workshop to remove all the metal shavings in the head and to increase CR ratio and remove any damage incurred by you working on the chamber yes the dremel will occasionally get the better of your grip but that's why you do this bit last!!

8. If you're still after more then it's time to do some custom work. The best way to really improve your A20 is to put bigger valves in. You can do this by re-using old exhaust valves and having them machined own to 33mm and reaming out the old inlet guides to same size as exhaust valve guides and then having 4 custom exhaust valves made-up, or you can have for the ultimate 12 new race stainless steel or titanium valves made up which will have narrower stems which will give you more flow again. Although stainless is tougher and heavier titanium is only for race use or mad people with tons of cash to burn.

9. Valve train can handle the rpms but the springs are the weak link in the A20, swap the platforms and retainers for all A18 or ET prelude ones okay up to 285 degree cams with 10mm lift or the better alternative is to use Exhaust valve springs and retainers all round from Prelude if your using exhaust valves all round after a big valve conversion. If you are using custom valves with narrower stems then ET1 2G accord heads have double valve springs and platforms for stock size valves, which can be modded to be stronger by shimming the springs or by using stronger springs from aftermarket source.

10. If your building that race head for the ultimate then you would need to build up a flow bench and make sure that all the ports are balanced so that they all flow the same numbers, also useful for the more intelligent of us who like dabbling with figures who can then work out all kinds of equations to get the CR ratio right and work out the supposed Bhp and torque that is should generate.

Hope this is useful and gives some people an idea of what they need to do to Flow a head on an A20. A18/ET/ET1 is a little different but mostly the same principles. If

you're still not sure I'm always available on e-mail as most of you know there's at least 10 people I'm currently helping advise on engines and they all appreciate the info and feedback they get. There is a really good secret to headwork and that is you have to be a perfectionist!! Can mean 10-20bhp difference from one engine built to another!! People who tend to be really good at Headwork tend to be more on the Arty side of things good with making things with their hands, modelers, painters, DIY people, woodworkers, if your none of the above stay well clear cause a Bull in a China shop is gonna end up in a whole heap of trouble!!

