Internet Tech Tips

compiled by David Trull

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Internet **V**air **T**ech **G**uide

Compiled by **Bigwave Dave (AKA David Trull)**

(Contains Corvair Tech information posted to the Internet)

This was compiled in the hope that it would be of value to the Corvair Enthusiast. These tips represent the opinions of the authors of the tips and often are based on years of experience, but remember these are **opinions**. The majority of the tips are anonymous, thats my fault, Sorry. Thanks to all those who have posted this info to the Web!

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BODY

Trunk rust repair:

This is a good place for a Fiberglass repair. As you mentioned, there's a right way and a wrong way to install Fiberglas mat. Done right, it's great. All rust must be removed, is the key. If you've removed metal from the trunk floor, you'll need something to back up the glass, or it'll sag. Use plastic film taped in place from underneath to hold the mat flat, then peel away after its set up. Feather with Bondo, prime & paint. A 1/4" hole drilled prior to painting will help drain away condensate. Here's how I apply Fiberglass.

You may modify or improve on this to suit your needs. The mat is cut with scissors to fit the job. Since this stuff develops a mind of its own, it doesn't like to conform to how you always wish, so depending on the repair (something other than a rectangle), I'll make a paper template of the repair and lay it out on the 'glass with a Sharpie. The cut mat is then laid on a sheet of scrap 4 mil plastic film or garbage bag to receive the resin. I mix the resin in 4oz. medicine cups and blend the hardener with little wooden Dixie cup spoons (don't ask). Mix fast, because in this warm weather the stuff sets up fast. With an acid (flux) brush, I'll brush the metal surface with an adhesive coat. The rest I pour on the mat and smooth out to soak the mat. Here's the tricky part. Getting the soaking, dripping mat to the work surface. Throw-away surgical gloves are a must here; this is nasty stuff to get off your hands. The mat is placed treated side down and smoothed into place. Don't work it too much, cause it'll stretch all over the place and fray. In warm weather it begins to set up PDQ and is rock hard in an hour. Cooler temps, a heat lamp speeds cure. Sand lightly to remove the humps, feather with plastic, prime and paint.

More Trunk rust repair

CAREFULLY check for rust at the bottom of the trunk, under the mat. In my car it did not look like there was a rust hole in the bottom. Some probing with a sharp tool will help find any major rust. If there is rust cut away all the bad metal with a tin snips. You have some options on how to fix the hole. You can weld in new metal or if done carefully you can do a good job with fiberglass mat and resin. I used the fiberglass and it came out nicely. The reason I had rust in the trunk bottom was because the sealer around the oval plug in the bottom had dried out and let road splash in. If you would like to see some pictures of the repair procedure please see my webpage.

If the surface rust really is minor then instead of sandblasting why don't you use a rust remover or converter. As far as removers go I have had luck with a muriatic acid scrub followed by phosphoric acid. Make sure if you do use any acid that you neutralize it well with baking soda and water. I have used a rust converter/stabilizer from Eastwood caller Carroless. It is pretty good stuff. I would stay away from extend for two reasons. One reason it does not work when it is cold in your garage/outside, the second reason is that the coating it leaves behind is very brittle and chips easily under a top coat. I would recommend the Carroless, it is like a paint and can be applied by brush or spray, it even comes in spray cans if you like. It will allow the trunk paint to adhere well also.

I used trunk spatter paint from Pep Boys, didn't feel like paying more for the same thing from Clarks. I scuffed up the old trunk paint with a Scotchbrite pad and then cleaned it with some lacquer thinner. I then sprayed the new paint on. It is easy if you follow the direction on the can. You'll need to apply many light coats and not a few heavy coats or the paint will glob up on the surface and look all nasty. Make sure you wait long enough for the paint to dry before recoating. You will also need to coat it all with a spatter paint sealer, also sold at Pep Boys, this will water proof the paint as well as smooth out the surface some.

More Trunk lock modification

1) I did this mod. on my lm several years ago.... all you need is a real long choke cable mounted mine under the dash on the firewall you could reach it easily, but couldn't see it... drill a hole in the top of the alum. piece that the lock turns insert cable and clamp it down. This will pull the lock open. one word of caution, you have to disable the secondary latch. (it keeps the hood from flying open if its not fully closed) make sure its closed ! One more thing, if cable ever fails you can always take out a headlight bucket to access the latch.

2) The Fiero uses a relay to activate the lock solenoid, the coil of the relay returns through the PRNDL switch on automatics, and a set of contacts on the parking brake switch on sticks. The Fiero power trunk release is a "generic" GM power trunk release, found in virtually every line of GM cars of that era. My '88 Fiero did not have one ('twas optional) but I was able to pop one right in. In my case, I found the identical release assembly in a Cimarron, a Riviera, and a Century. Can this power lock release be adapted to a Corvair trunk? I don't know; I never looked at it with that in mind and I have since sold the Fiero. My ragtop has a remote trunk release, and has no front keylock release at all, the hole is blocked off. Seems a time or two, people had tried to break into the trunk. No fooling. Now all they see when they try to wring the trunk lock cylinder off is a blank plate covering the hole. The release is hidden inside. And I do indeed have the release rigged so that it has to be pulled twice.. pull once, then push it back and pull again... so as to get around the secondary latch which I certainly wanted to keep functional. I sure don't want the trunk to fly open on the Interstate because a dumb-ass passenger manages to find the remote release and yanks the handle while in the process of asking what it does. One point that needs to be considered concerning a cable/solenoid/vacuum operated trunk lock opener is that MOST cars having such a device installed from the factory will also have a safety latch/catch on the front compartment that requires manual operation. Install a latch opener on a Corvair without creating some form of a safety catch and then accidentally trigger the opener while driving at road speed and you will witness instant smashing of your windshield and/or instant removal of the hood. If you watch carefully in the rear view mirror, you will be able to see where the hood lands (like out in a field or in the lap of a person in the car behind you).

Blackout trim :

I Blacked a lot of the chrome on my 62 spyder in 1983 when it was first becoming popular. I did the two bumpers, the headlight doors and the 3 ornament pieces, the spyder script and Monza emblems on the sides, the louver pieces behind the rear winder and the rear emblems/tail light sockets/license plate frame and rear grill. I had the two bumpers chemically stripped all other pieces I simply glass beaded at my shop. I then painted with semi-gloss black several coats and then some clear coat all from shaker cans, bumpers too. It lasted a couple/three years and then the front pieces were pretty well sanded so I simply cleaned everything up and did it again. That has been the program since, every two or three years the car gets a facelift. I have tried several brands of paint but they all get pitted. The really RIGHT way to do this would be powder coat the parts, then you could add the door handles/locks and maybe the chrome around the door frames.

Widening wheel wells:

It doesn't take much. My wheel well openings have the stock wheel well trim on them (as opposed to not having trim, like some folks use). The trim measures about 1 1/4" wide. At the top of the wheel well, where it's been cut the most, it now measures about 5/8" - 3/4". Because there is still a significant dimension here, you can't see that the lip has been cut, just by looking at the car. The total width of the cut or trimming is about 9". Actually it is cut and rolled some with gentle taps of a hammer to roll the edge nicely. So, if you laid on the ground on your back and looked up at the wheel well lip, you'd see it was about 1 1/4" wide but has been cut to about 5/8" - 3/4" in the middle. The cut is a gently arc with a length of about 9". Understand? Now, just because this is how MINE is trimmed doesn't mean it's how you have to trim YOURS. Mount your wheels and tires, put some weight in your trunk, turn your wheels full lock one way, mark the trim where it contacts or is close, turn the wheel full lock the other way and mark it again. Now remove the wheel and trim the lip, then repeat the measuring procedure. Remember that under the force of cornering your tire will move some, so you have to have some clearance. All-in-all, I think the worst situation is backing out of a driveway with your wheels turned sharply, then dropping down over a bump. I think the worst situation I've had with tire clearance was when I autocrossed with 15" x 8" Corvette Rally wheels. These wheels have quite a bit of "dish". I used 225/50-15's. They were fine on the rear, but close on the front, because of the wheel offset. I don't know what the offset is on those wheels, but it would be best to have less. Remember, it's all in the offset. With the proper wheels, you can fit pretty big tires in a Corvair wheelwell, especially in the rear. I have lots of room on the rear with my 225/50-16's. The largest tires I can remember seeing on a late-model are the tires used by Jay Dover. You may have seen Jay's V8 coupe. Last I knew it was still gray primer. Jay uses early 16" Corvette wheels, '84 style. I'm not sure of the width. I'm also not sure of his tire size, I think they're 225/50's, but I can't remember.

Rust removal prep:

Phosphoric acid is sold as "Oxy-Solv" through Eastwood's catalog or "Metal Ready" by POR-15 (Clark's carries this also). I have used Metal Ready and have been very pleased. Fairly inexpensive, too! Applications can be spray bottle (which is supplied with the gallon sizes), pouring on, brush, etc. But be aware that it will react with aluminum and chrome and will etch it. So be careful in application. It is safe to your skin, but I would wear gloves just the same. No dilution is necessary as water neutralizes the acid. You leave on as long as it takes to remove the rust particles. Use a Scotch Brite pad to air you in removing the rust. You will sometimes see a reaction with the rust and acid (bubbling) which means the rust is being removed.

It is neutralized by water, which reacts with it and leaves a zinc phosphate (whitish) coating on the metal surface which prevents further rusting. Make sure the area FULLY dries before applying POR-15. It is very handy when you are stripping a car, so you don't have to be as careful where it goes, but if you want to save the paint beyond the area, try not to gte any on the paint and, if you do, rinse of immediately with water.

Adhesives instead of Welding:

In the process of restoring a 66 Corsa Coupe, it became necessary to replace several body panels due to rust. I contacted the vendors and found most of the required panels. The steel panels are excellent, the fiberglass panels are not as good.

Anyhow, I contacted several local welder's for estimates to have the panels welded to the car. The responses were depressingly high. I considered buying a welder and doing the work myself. This would require lots of learning and I didn't want to learn on my Corvair.

A friend mentioned adhesives to attach the panels. Yea, right, glue it on. Well, I found several modern adhesives that are used by OEM and body shops for doing just what I wanted to do. I went with FUSOR products (www.fusor.com). I purchased a kit that included several adhesives, putties, applicator gun and misc. extras. The adhesive is basically a two part epoxy that is applied through a special caulk gun. This stuff works great. It is stronger than welding and none of the heat problems of welding. An added benefit is that the joint is sealed from moisture. Best of all it was quick and easy.

Polish aluminum trim

I asked same question awhile ago and got some good answers. You need to remove the anodize, then can polish using buffing compound and various buffs. See www.caswellplating.com for some good info and a polishing and buffing manual you can download. I have also used their Nickel, copper and zinc plating kits- good stuff.

I also purchased a 3M aluminum polishing system from 3M which consists of several grades of high tech polishing film, a sanding block and instructions. Uses WD-40 as a wet lubricant. I tried it on rocker trim after removing the anodize- works great and less messy than buffs. To maintain polish, you need to reanodize or cover with a good high performance clear. See: www.3M.com/finishingsystems.

Front Spoiler for late model:

I think I read in the Corsa Technical Guide that a Chevy S-10 air dam will work well with some minor alterations with a late model, though it might not be too good on a nice restoration. Yes, this will work but it definitely does not look stock and hangs quite a bit lower. Also either the 1968 or 1969 Camaro model will fit. I like the 1969 unit, available in the repro market fairly cheap. I would use side supports on the tips, there is already a

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hole in the end of the spoiler for the mount. A piece of aluminum rod, smashed flat on the tips would do fine**.**

Aftermarket Spoiler :

I have been using the 'Corsa Enterprises' spoiler on my cars since 1975. The typical improvement is around 15% depending, naturally, on the car. You can really notice the difference at high speeds and cross winds. The SOURCE purchased the original tooling for this wonderful product and is the current producer. The spoilers are available through your favorite Corvair vendor. I highly recommend this spoiler.

The 'SOURCE' spoiler is hand laminated fiberglass. The G.M. product is a plastic material. The design of the SOURCE spoiler is a 'snowplow' design. The G.M. product is more-or-less a valance panel *As for performance, the SOURCE spoiler (former CORSA ENTERPRISES) was tested and the following results noted. These test were conducted around 1976*.

A 20.2 mile loop at 60 m.p.h. average.
Stock '66-'69 G.M. spoiler: 20.2 m.p.g.
1969 Camaro stock spoiler: 20.9 m.p.g.
SOURCE spoiler: 23.3 m.p.g.

Wool tuffs where installed on the car when the tests were run. I'll skip all the details, but the SOURCE spoiler generated more frontal down force and cleaner air flow over the entire front of the car. More air flow was also noticed on the rear portion of the car. Ray Sedman From an esthetic point of view, the SOURCE spoiler is very attractive.

Door paper substitute :

A good replacement for the paper is Tyvek, commonly used as outer vapor barrier on houses. It is spun bonded polypropylene so it looks like paper and completely waterproof. Try 2-sided tape to hold in place or save the old putty off the doors

Increasing Speedo life on repro Speedo cables:

When you install a repro cable, you can increase its life by the following:
1 Lube the cable really well, especially the first 12" from the wheel. This is where the cable typically fails, because it makes the sharpest bends here. No need to lube it any higher than the mounting bracket in the wheelhouse. **2** Loosen the bracket that bolts the cable to the wheelhouse near the brake hose.. After the cable is attached to the speedometer , run through the floorpan, and in the locator clip by the filler neck hole (when used, late 65/up), pull out any extra slack in the assembly towards the wheel. This usually gives an extra inch or so of cable in the turning portion; now slide the mounting bracket up to match the hole in the wheelhouse. This will give you a little more cable down there, so less of a bend on sharp LH turns. A great lube for Speedo Cables is Graphite

Emblem Restoration

You might want to send an email to Mark in Chicago. He owns a business that is one of the nicest and best that I have come across. He does all kinds of polishing, plating, and restoration work on pot metal, stainless, chrome, etc. His prices are very reasonable also. His email address is: Mark <thfinishingtouch@hotmail.com>

1965 and 1966 lower rear grille

In 1965 there are two grille styles, and two paint treatments.

500 and Monza share one type of grille stamping, on Monzas the grille teeth are painted bright silver, 500's they dont bother. There are two distinct toothed areas on '65's.

'65 Corsas have the entire toothed grille areas cut out and 2 bright metal inserts which include teeth and a bit of the surrounding area and very closely resembles the other grille mesh is used. There are three peices to this finished grille panel, the main stamping and the two bright inserts.

All 1966 on cars have a different from '65 grille, restyled for one larger lower opening. 500's leave the entire thing body colour. Monzas have the teeth and (generally) the surrounding 2-3" or so recessed area surrounding the teeth painted bright silver to the edge of the 'bead' where the grille features meet the main body contours and exterior paint colour. Corsas are supposed to be silver painted just in the teeth area and have a bright metal bezel covering the 2-3" depressed area surrounding the grille teeth. The insert divides the grille mesh area into two sections down the middle. The idea is the Corsas are painted just in the area thats visible when the bright bezel is installed.

Many 1966 Monzas I have seen have inadvertently been painted to the Corsa spec from the factory, this was especially common in Oshawa production- just the grille teeth are silver but theres no Corsa type bezel, just less silver paint. I have also seen a few Corsas with the full Monza paint treatment and a bezel besides. Painting the grille Monza style means the silver paint covers an area larger than the bright metal Corsa insert covers and it doesnt look well finished. In 1967-1969 all the Monzas had the larger area covered with silver paint, thats to say all the teeth and the large area surrounding it outwards a few inches. 500's are entirely body colour every year. The 1966 grille does not fit the 1965, but the 1965 grilles fit everything.

BRAKES

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Dual master cylinder conversion

1) This was the first major project I attempted in my car. I picked up a rebuilt master cylinder for $25- (I haven't tried to return my single for the $5- core). I must have spent close to $75- on lines, plugs, adapters, fittings, towels, cleaner, fluid and tools to make everything work, but work it did. Of course, I broke one of my front wheel cylinders in the process, and had to replace the entire front system (another $100-, rear will be replaced this spring). My car was disabled for more than two weeks in a cold, sandy parking lot as I waited for parts to arrive, or bled the wheels one at a time, etc. In the end I still couldn't get everything quite right and had to have a mechanic doublecheck my bleeding and brake adjustment, but I got it pretty close.

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2) As I se it, the Vair dual system has that small steel 'block' just outside the master cyl., for the purpose (only) of turning on a light if and when one of the lines fails. AS I understand it, there is a diaphragm inside that 'block' that moves to one side or the other, to allow an electrical connection when this happens. This means that the foot pedal then cannot move far enough to provide adequate braking on the remaining working system. So, it seems to me the answer is to remove that 'block' and plumb straight into the usual dual lines. And, yes, there is a kit available to do just that. There is even a dual master cyl with outlets on the other side to make the job easier.

3) On a Corvair, if a rear line goes out, the front tires will lock up pretty easily; if a front line goes out, the car will stop reasonably well. Just the reverse is true on a front engine car. The dual master set up requires that the brake shoes be adjusted properly for the system to work in failure mode. If your pedal travel is considerable when everything is working, you'll never get enough fluid displacement to create stopping pressure in the failure mode without, as you found out, rapid pumping of the pedal.

4) All that any "conversion kit" has will be the dual master cylinder, outlet port adapters, one or more brake lines, and a plug for the main distribution tee. Basically you remove the rear line out of the distribution tee, plug the tee, then using a union and the new brake line, connect the rear line to one of the dual master cylinder outlet ports. the other outlet port is connected in the same way the original brake line to the master was; just that now it only works the front wheels. the only additional line involved is the one that runs from the end of the rear brake line to the new master cylinder.

5) When I disconnected the rear brake line from the firewall fitting and putting a inverted flair plug in its place, I installed another 1/4 inch inverted flair tee fitting onto the rear brake line, right up against the original fitting, that I had just disconnected. I installed another inverted flair plug into the bottom hole. I drilled a1/2 inch hole, 7/8 inches in back of the existing line and in line with it from front to back. Then I purchased two 1/4 x 12 inch brake lines and bent them to go from the existing and new fitting hole, going under the master cylinder and up to the ports with the adapters that are called out in the tech articles. This was a very easy job and could be reversed for any nut that wants to run with a single master cylinder. There was no trying to bend the rear brake line while laying on your back under the dash or trying to cut and double flair the line. This project used all standard fittings and lines that are available at any automotive parts store. Flush system with denatured alcohol, not rubbing alcohol

CARBURETORS

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Center mount carbs

Quadrajet instead of a Carter or holly

I did just that with a Q-jet, got the adapter to fit the Q-jet to holley mounting. I ran this on my Corvair circle track car. Yes a complete Corvair! I ran a small block carb, looked for the smallest jets with the largest metering rods for the primaries and just played with the secondary top butterfly spring until it worked OK for me. With this carb I had no turn cutout of any kind on a 1/4 mi. oval. Other cars would out power me through the straight but I didn't have to stop for the corners!

Problems with center mount 4 barrel?

The fuel distribution problems at partial throttle require that you understand the function of the stock intake manifold. On a single carb head the position of the carb is set so that the airflow reverses between each cyl. filling. this was the only way that they could be sure that each cyl. would get an equal amount of fuel. If you have a two carb head and set it up so that the wrong carb is running as the primary then you get almost
all the fuel going into the two nearest cyl. and the far one goes very lean. If you put a 4x1 adapter on then when the 4bbl's primaries are open and the secondaries closed most of the fuel will be following the runner below the pri. bbl. and on one side that is the wrong side. I have experimented with butterfly valves in the secondary runners that open and close with the secondaries and gotten good results, but not much better than closing off the secondary runners all together.

A further explanation of Ed's description above can be found on page 13 of Bill Fisher's masterpiece "How to Hotrod Corvair Engines". If you look at the diagram for the layout of the 2 PRIMARY carbs and mentally add in the extra circles for the 2 SECONDARY carbs, you'll see that on the driver's side, the primary carb is Rearward,

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while on the passenger side the primary carb is Forward. All of the 4 runner-center-carb manifolds I have seen are setup so that both PRIMARY barrels (of the 4 barrel carb) will feed 1 PRIMARY "hole" on one side of the Corvair engine and 1 SECONDARY "hole" on the other side. I believe that this misalignment causes much of the poor distribution problems (at low and moderate engine speeds/loads) associated with converting the 140 to a center mount 4 barrel carb. Has anyone seen a center mount manifold that corrects this situation? Frank Burkhard

Virtueless Center mount 4-bbl

With all this bad rap the center mount 4-bbl system is getting maybe I should change back to the stock setup. NOT. Almost everything said in the past and near past has been anecdotal type of reporting. No measurements, except for Bob Helt's statement about a dyno test. But even Bob doesn't give us the controls, the variables. I've never seen a back to back test between the two systems. It can be done. Frank, Jim's system, the one that was like an on-off switch, I've asked you to bring it over so we could look at it together. Yes, Frank, there is a better system, the LeVair 6 runner setup. Yes it still has the lack of carb heat. As to the lack of power that Bob alluded to, does anyone know how much HP is required to get a Corvair to 125-130 MPH? Will a streetable set of Rochester's do that? NOT! Don't mind me, I just want people to think about the otherside. For instance why is it that for a more than a handful of years a center mounted 4-bbl has won and/or taken second in SM at Lime Rock? I've been using this system since '76.

Out here in LALA land we don't have trouble with ICEY manifolds, so "center mounts" and "tri-ports" RULE in the desert/street. Most are using the 500CFM Holley 2BBL with excellent results...I use a FOMOCO 350 on my buggy [single port head] because if I have trouble I can remove the carb TOP and watch it work with the engine running!! And it works on 55 degree sand hills as well as UPSIDE-DOWN!!!

140 center mount 4-bbl

As if this hasn't been beat to death, I'd like to add my $.02. Agent Orange has a Holley 390 4bbl off the shelf and works fine thank you. No corner stumbling, even in hard autocross. Only modification was the quick change Vacuum sec adapter with the softest spring in it. Oh, yeah, I believe we did something with the orifice and check ball on the secondary port also. What I found out is, It ran much stronger with a 450, but had a hard time going back to idle, needed rebuilt no doubt (among other things).In an early model the deck lid will get in the way. I'm running the 1 inch cal custom air cleaner and had to cut the innards out of the deck lid so that could fit. also deleted the insulators on the heads. Am using a 4 ft cable throttle from the transmission pivot. Overall I'm happy, can get up to 30 MPG and still has an impressive pull - not at 30 MPG though. Glad I don't drive it much in the winter.

I used a Carter AFB years before I tried the Holley. The AFB worked just fine, except for being cold-blooded and no choke. It did require plenty of throttle on a dead start to keep from bogging though. It was so long ago that I don't remember the model or what engine it came off. In the dyno tests I referenced in HRM, the AFB was tested too. It performed about the same as the Holley.

4 barrel holley:

If you do decide you want a Holley, go with the #8007. It's a 390 cfm model (the smallest 4 BBL), with vacuum secondaries and an electric choke. The carb is of the 4150/4160 series (the most popular Holley's); technically its a 4160 series, because it has a secondary metering _plate_, rather than a complete secondary metering _block_. The 4160 series are just 4150's that have been slightly cheapened up with a cheaper secondary metering circuit. The plate-based system can be changed to metering block if you want removable jets for the secondaries. This would make it into a 4150. I didn't bother. There is also a #6299 390 cfm Holley that is available (often at Vair flea-markets, when people are trying to unload it). You don't want this one. No electric choke. It may also have mechanical secondaries (I forget), which suck on the street. Also suggested with the #8007:

1. The high volume (50cc) accelerator pump kit. You'll need it to try to cover the massive drivability hole when the throttle opens at low airflow. A necessary band-aid I'm afraid.
2. The thermistor-sensor electric choke gizmo. I forget what they call this, but it's a ring thermal with a thermistor on it that attaches to the electric choke ground. It'll make the choke open as a function of engine temperature (use an upper shroud bolt) rather than time. Definitely improves cold drivability.
3. Quick change secondary spring kit. Gives you a bunch of different springs and a new 2ndary diaphragm cover to let you tune in the secondary opening flow point and rate. This might be 2 kits, not one (a spring kit and a quick change kit). You'll need the spring kit (I think the secondaries open too fast out of the box); the quick change kit is suggested, but optional.
4. Accelerator pump cam kit. This is a whole bunch of plastic cams that you can swap in and out to get the pump shot just right. You'll need this if you don't want a bog every time you give it gas.
5. Primary Jets -- I think I wound up leaning mine a bit
6. I recommend reusable Teflon fuel bowl gaskets if you're gonna screw around with jetting. The stock pressed paper stuff is only usable once, and you'll spend a lot of time scraping otherwise. DON'T reuse the stock ones!!! A leaky gasket is quite hazardous, since the float bowels are side hung (= constant gasoline leak onto engine).
7. A good linkage kit. I think the one I have came from Clarks a long time ago. It's OK.

<u>Turbo carbs</u>

YH float adjusting :

I use 3/4" to 5/8" for float level. I have found to err on the 'high' side with the YH carb (i.e. a 'fat' 3/4) This helps prevent hot soak and fuel dribbling out of the discharge cluster during idle and hot soak. Measure this from the bottom of the float w/the cover inverted and the weight of the float on the spring loaded needle. I have a 3/4" dowel I use to pass under the float as a go-no-go gauge.

Float drop is not real critical, 2 3/8" drop from the gasket surface of the cover to the bottom of the float.

Turbo carb rebuild :

Here are the 'basics', I am sure I have missed a few things. First, I have not included anything that is in the shop manual. This is the stuff, that is not in the shop manual. Take a deep breath and have some fun! Thoroughly clean the carb. I have made special tools to remove the plugs in the carb body with out damaging them. (most of the time <g>) I feel this is necessary to get all the passages clean. I also use an ultra sonic cleaner to do the final cleaning of the carb. The stuff comes out real clean. (O.K. so not everyone has an ultra sonic cleaner....sorry <g>) With a mill file, flat file the bowl gasket surface flat. Use a new gasket anytime you take the top (bowl) cover off. Install a 'ball type' inlet valve. Get it from The Source

The gasket/seal between the cast iron throttle shaft casting and the carb main body is a source of trouble. I have spent a 'bunch' of time getting this right. Fuel is pulled through this 'mess' to feed the idle and low speed circuits. Try to make sure this seals up correctly. Any vacuum leaks here will cause poor driveability, poor fuel economy and a lean accelerator pump squirt. Fixes depend on the carbs condition. In some cases, I have found that the top screw that fastens the throttle shaft casting to the carb body is too long, or the supplied gasket(s) are too thin. The screws will bottom out against the top bowl and prevent sufficient clamping force of the throttle shaft casting to the carb body.

The same holds true for the top bowl and body seal. This is one reason that I stated to not use a top gasket more than once. Pay special attention to this stuff.

YH's are very sensitive to fuel pressure, amongst other things. If you have a show car, make sure the fuel return line is working. If you can/want, get a fuel pressure regulator. Set it at 3 - 4.5 P.S.I. Err on the low side first and go from there.

Run the float level a 'touch' on the low side. The above will minimize any tendency to 'dribble'. *Other things:* Make sure your top gasket is correct for your year (compare with what you have on the carb now) and do not use a top gasket more than once. I.E., if you pull the top off, replace the gasket. The Clark's top gaskets are good material, but need to be trimmed to avoid interference with the metering rod arm. When it is installed, note this 'problem' and it is obvious where to trim the gasket.

If you have some time on your hands...... I have found the 'leadway' on the metering rod/jet combination to be very narrow. I have never found a stock combination to work (well enough for me). Also note that I have not rebuilt a Turbo to 'stock' specifications. So, a stocker Turbo may work well with a 'stock' rod/jet combination.

When you get close in tuning the carb, you will notice a 'lean surge' between 2,000 to 3,000 rpm. Mostly noticeable during 2-3 shift and the 3-4 shift. Ideal time to notice this is during a light 'cruse' and then, get into the pedal just a touch more. The engine will lean way out. If you are running w/a EGA, it will go off the scale. If you floor the pedal, the mixture is fine, if you back out of it, it is fine. What is happening: the carb can not track the fuel delivery requirements rapidly enough. The 'enrichment' is determined by a vacuum signal on the back side of the metering rod/accelerator pump diaphragm. There is not enough 'signal' to move the metering rod to richen the mixture. I have spent over 100 hours to minimize this and there is no way to completely fix it. You can get real close, but not perfect. I am sure most people will not even notice this.....I have too much time on my hands! -Ray

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YH Carb problems:

Carter carb that drools could be due to percolation or a missing or plugged fuel return line. There's supposed to be a thick (3/8") gasket between the carb and the turbo to reduce heat transfer. Secondly, the fuel bypass line should be operational to prevent vapor lock and to bleed off pressure after shutdown. If the Carter YH float isn't perfectly (well almost perfectly) centered it will bind against the side of the bowl. The fuel flow then doesn't shut off completely.

Where is the accelerator pump discharge is from on a YH?.62 has a discharge tube in the main body just before the throttle body. 63 and 64 discharge into the main venturi cluster, 65 and 66 have a discharge port in the throttle body itself. *larry claypool*

Electric choke conversion :

I have used the electric choke conversion kit listed in the JC Whitney catalogue ("fits all cars 1960- 97 blaa blaa blaa...). It runs about $18. ea. Order for a 1966 Chevy Impala 283, Rochester 2GV carb, manifold mounted choke. You will get a round choke assy., electrically heated, on a small mounting bracket you can bolt to the shroud; plus a heat sensor that varies the amount of "ground" the heat coil gets a according to temperature. The choke assy. has a rod coming out of it to go to the carbs, and the choke itself is adjustable for tension (like most carb mounted chokes). Some bending of the choke rod may be required to get everything to line up OK, but really , it is a fairly simple conversion. I use this set up on 61's mostly to replace the typically inoperative manual chokes those cars have.

The only trouble I have had with these is the choke seems to come off too quickly; I ended up using a ballast resistor in the feed wire for the chokes, and mounted the sensor on a shroud bolt rather than a head bolt. That seemed to give the right amount of choke. As I have mentioned several times before, I don't have any technical reference material here at home - which is where we have our computer - so I can't check this right now for absolute certainty, but it seems to me the electric choke kit from an AMC (Hornet, Gremlin, Javelin, Matador, whatever) with a 232 6cyl 1 barrel Carter YF carb from the early to mid '70s ought to fit the Corvair YH just fine. *Larry Claypool*

Su Carb info :

The largest SU carbs are 2 inchers -- depending upon the year, the E-type Jaguars used either HS-8s or HD-8s. In typical British idiosyncratic fashion, the number refers to diameter, but not in any simple increment.

H1 = 1 1/8"
H2 = 1 1/4"
H4 = 1 1/2"
H6 = 1 3/4"
H7 = 1 7/8"
H8 = 2"

Corvair content -- use a 2" SU for a turbo engine if you want to play that game. I have one, but am too busy with other projects to try to install and tune it. Also Found on Austin Healeys" They are only on 3000 cars 1964 and later. SU carbs are 'constant depression' units. Under steady state conditions, the piston rises to open the throat so that the vacuum (depression) is always at the same level, no matter what the throttle opening is. You

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must find out how high the piston is at the specific speed/load conditions, and only modify that portion of the needle to affect the rich/lean condition. During acceleration, the rise of the piston is retarded by the oil in the dashpot (top of the carb), and momentarily causes an increase in the vacuum, richening the mixture. The amount of richening and duration can be modified by changing the viscosity of the oil in the dashpot. Thicker oil means richer and longer duration.

Turbo carbs

I'll share some of what I have learned about YH, though I'm sure there a guys that know more on this site. Float height, I've always been big on following specs, but not in this case. On mine I lowered the float in 1/32" increments until the hot soak and hot stumbling problems went away. That was 5/32 lower than spec, while keeping the top of the float parallel with the top of the carb. No performance problems at this setting, at least for me. Choke and choke piston must be kept impeccably clean and free. Also, the heat tube from the air cleaner through the Turbo base to the choke. Blow by gets sucked in here and coats it. This slows the heat transfer and gums the choke. Shoot lots of carb cleaner through it. The top cover gasket and surface must be in very good shape, I also coat it with "high vacuum silicon grease". Leaks here can affect the vacuum controls. Also, look inside the top cover for signs of anything touch, rubbing or scrapping it. The clearances are tight, the small tension spring on the metering rod and other metering parts can bind here. Find out why and fix it. Keep top cover screws tight. The slide wears the slot between the throttle link and metering rod, this affects the metering rod action. You can put JB weld in it then use tool files to get a smooth fit. I keep fuel pump pressure at max and have an adjustable regulator after the filter. This keeps more fuel going back to the tank and keeps the fuel temp down a little. I can't go under 3 PSI (maybe because of my float adjustment) or I will lean out and detonate in third gear. Fuel slosh, you can short pieces of brass tube together (like a honeycomb) and fit them in the open area of the float chamber. Saw it done on other carbs, but never did it on this one.

2) OK call me crazy but I love (or at least love/hate) my Carter YH carb. I have used Webers and Su Carbs and while they can produce more power they also have faults. Mileage and "driveability" being the biggest. I basically start with a late carb (any needle and spring carb will do). Be sure that all the passages are clean and open and the top gasket surface is level. Now don't laugh, I use a common $3.00 1 7/16 hole saw to bore the carb out. (remember to check twice, as last I knew the local Carter YH store closed down) Bigger than 1 7/16 will make the walls too thin. Another mod I make is to add a vacuum line to the throttle body by drilling a hole in the boss not used for anything toward the throttle plate. I then press a .125 brake line into this hole and use it for a vacuum advance line which correctly retards at idle. The mileage is better and the engine runs much cooler under normal aspirated driving conditions with a vacuum advance than it does with the stock pressure retard. Distributor timing must be modified! A 2 ball check valve and a low float level to control the fuel level which along with a insulating gasket of at least 1/4" between the 2 carb body's seams to also all but cure the heat soak problem. I am using the stock type gas filter with the fuel return line. Playing around with jets and rods could be a full time job. I did start using brass wire coathangers to custom make my rods as they are easy to form and taper. The biggest problem I have had with the YH is the restriction at the stock tin can airfilter causing the setup to run rich on the very high end. I did play with a bleed off hole in the acc pump tube but that cause more grief elsewhere. With a clean foam filter and reversing the end plate (cover) I climb to 7200 RPM without a problem, but it is rich compared to no airfilter. I do adjust the choke slightly tighter in the warm weather for faster startups. My engine faithfully idles at 900 rpm with my cam and all. Gas mileage, if I don't play many games, is around 16mph. I develop more boost/power than I should.

2600/2800 V6 Weber Carburetor substitution :

(This weber carb article was found on a Capri site but have been used on Corvair turbos) If you want to get more power out of a Capri V6 but don't want to switch to a 4 bbl. carburetor, there is an alternative: The **Weber 40DFAV**. This carb is somewhat similar to the 32/36 DFAV (Holley 5200) that was used on 1972-74 V6 Capris, but it is larger and has throttles that open simultaneously instead of progressively.

. If you have a 1972-74 Capri and don't mind retaining the 90 degree adapter, then you can bolt the 40DFAV directly to the adapter.

I used a Weber 40DFAV-1L on a 1976 Capri II 2800

I used the following calibration, which was provided by the Weber distributor:

```
        Main Venturis, 28mm
        Aux. Venturis, 4.5mm
        Idle jet, .60
        Main jet, 1.80
        Air corrector, 1.85


        Emulsion tube, F2
        Needle Seat, 2.50
        Accelerator pump nozzle, 5

        I'm not sure about the idle air bleed size, but the opening is
a
        little bigger than 1/16".

        There are also very small holes (perhaps 0.040"/1mm) drilled in
        the throttle plates.
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I believe there is also an electric choke version of the 40DFAV available, which would eliminate any possibility of choke hose interference. I have also heard that the Weber 38DGAS works very well. *More on jetting* The 32/36 DGAV are too small for the 3.0 litre engines. they'd be OK for the 2500. The primary venturi is only 26mm, whereas the minimum recommended by weber would be 28mm. However, you can make them work OK with 140-145 main jets and 160/170 air correctors. The 3.0 litre and the 2002 engine have the same size cylinders, so you can use the 2002 jetting.

Weber 32/36 DFAV: (Can be used on Corvair Turbos)

The Holley 5200 was a license built copy of the Weber 32/36 DFAV 2 barrel (2 venturi) carburetor. This carb was also produced by Motorcraft under license. Most 1972-74 V-6 Capris and some 1971-74 Capri 2000 SOHC used this carburetor, although the V-6s used larger jets. Both types had a flow rating of 270 CFM at 3 inches of mercury. IMHO the Webers are generally a bit better made. Set them side by side and the Holly-Weber LOOKS downright shabby by comparison. Unmistakable evidence of good old Yankee cost reduction mentality...but it sure works good! And, at least for me, the Holly-Weber is much easier to come by. I have a pile of Holley 5200's in my basement, but only one

Weber 32/36 DFAV (we're not counting the one on my car...) (I have never found anything that could be done with a Weber that I couldn't do with the Holly-Weber.) The Holley 5200 will accept all the Weber jets, emulsion tubes, etc. In some respects the Holley is even more "tunable" than the Weber. There is a wider selection of auxiliary venturi sizes and types for the Holley, and Holley produced carb bodies with several different main venturi sizes. As far as I know Weber only offers 26mm/27mm main venturi sizes. On a turbo if you're on a budget the stock 32/36 DFAV (or 32/36 DGAV) carburetor can be used with minor modifications. The simplest approach is to use a "draw through" arrangement, since this eliminates the need for a sealed/pressurized carburetor and a fuel pump capable of overcoming the boost pressure. The only trick: You must connect the vacuum port for the full power valve to the "boosted" side of the turbocharger so it will provide enrichment whenever the engine is on boost. Unfortunately the port is in the bottom of the carb, so it's not just a matter of running a vacuum line. I suggest drilling out the lead plug at the end of the vacuum passage in the carb cover that leads to the full power valve, blocking the passage that leads down into the carb body, and adding a vacuum hose fitting where the lead plug was. Regarding appropriate fuel pressures for the Weber 32/36 DFAV or 32/36 DGAV: It looks like my previous reply of 3.0 PSI max is not quite right. The '71 Capri 2000 shop manual calls for a fuel pressure of 3.8 to 5.0 PSI, and this car is fitted with a 32/36 DFAV. Most US Capri 2000 had Weber 32/36 DFAV carburetors; the rest had the Holley 5200, which is a licensed copy. All US Capri 2300, 2600, and 1974 2800 had either the Holley 5200 (mostly) or Weber 32/36 DFAV (a few). Many other 2000/2300/2800 powered Fords from the same era had them too. Tuning was of course different for each engine, and it also changed just about every model year (mostly for emission control purposes). Most versions had 4 air cleaner bolts, but at least some of the ones used on the 2800 had only 2. In Europe many Capri 1600 and most Capri 2000 used the Weber 32/36 DGAV series, which are very similar to the 32/36 DFAV. 3 liter models used either the 40 DFAV or 38 DGAS. The 32/36 DGAV, 32/36 DFAV and Holley 5200 are "progressive" 2-V downdraft carburetors. 40 DFAV and 38 DGAS are "simultaneous" 2-V downdraft carbs. Unfortunately I don't have a listing for the stock Europa carb, but the few Lotus listings I do have show DCOE series non-progressive sidedraft carburetors - completely different animals from the Capri carbs.

Turbo Weber Set-up:

Weber carburetors work basically on a pulsing theory. They are normally installed on a single runner system for each throat and with no balancing plenum. They are very sensitive to signals and are insensitive to flow direction. As soon as these carbs are bolted onto a turbocharger they are forced to become flow sensitive just like Holleys, Q-Jets, etc. Their sensitivity gives very good reaction to the extremely poor signal of a -not on boost- turbo engine. However, since they are designed to operate mainly in a fully open mode and essentially have little or no progressive circuitry (masked by a HUGE accelerator pump) , they cannot accommodate an engine whose airflow varies suddenly from 300 cfm to 650 cfm. Imagine a 500 cfm two barrel Holley on an 80 hp Corvair or a 250 cfm two barrel Holley an a 350 cubic inch Chevy and you can begin to picture the problem. You essentially have both of these engines in you car. GM put the tiny single barrel side draft carb on to cover the low speed characteristics and said to heck with the high flows, we'll just use it for a boost control. A 40 DCOE Weber with 26 mm chokes (

venturies) accomplishes the same thing with a much nicer carburetor. At high flow rates, the air flow becomes sonic , goes dead rich (because of that great flow sensitivity), limits the boost to 9 or 10 psi (gauge) and you must up shift early because it won't rev any higher. This may be just what you are after in some cases. Most would rather have greater engine flexibility and a waste gate. The way to prevent going dead rich is to use larger chokes, which gives the dreaded low end bog.

Obviously, a variable venturi carburetor such as a Rochester Quadrajet, spread bore Holley, SU, or a Predator is needed. LeVair Performance Products has modified 40 DCOE and 45 DCOE Weber carbs to operate in the progressive manner of the above carbs. They have separate primary and secondary bores. The throttle rod only operates the primary side. The secondary side is operated by a signal from the primary venturi booster to a Holley 4 bbl vacuum diaphragm which opens the secondary side only after the primary has adequate air flow. Normally this carburetor can just be bolted on and driven if jetted according to the Weber manuals i.e. main jet size equals 4 x the choke size, Air corrector equals main for racing, or a/c =main + 60 for economy. If this doesn't work, check to see if the booster venturies are in the small 2 or 3 range. Too large booster venturies give poor signals and require much richer jetting. You never know the history of these cars or their intended usage. Since the idle signal is being strained through a remote, non operating turbo, the idle jet size usually needs increased. This increase may have to be .020 to .030 for racing. this is because the Weber has no real transition circuits and must "tip-in" on the idle circuits. this is why the secondary idle circuit should be larger and certainly not plugged. The emulsion tubes should have more holes for the street and less holes for racing. The air correction jets can be considered fine tuning. The secondary vacuum diaphragm is from a Holley 4 bbl. They are shipped with a "brown" spring which is fine for a "hot" Corvair which runs like a V8. Some of our customers overestimate the performance of their cars and may need to buy the spring kit. Bog can usually be cured by using the soft "yellow" spring. The secondary shooter for the accelerator pump should be plugged to divert all of the fuel to the open primary. This is a lot of fuel and is wonderful for racing. The pump jets are easily changed it less shot is desired. Almost any combination of chokes will work. We recommend a primary of approximately 33 mm. This gives the same or better response and flow of the stock carb or the two 26mm set-ups. We recommend a secondary of 36 mm to 40 mm for maximum output and to be able to shift at higher rpms without going dead rich. By the way-turbos like load much more than rpms--UPSHIFT. If racing, jet the primaries more rich and the secondaries more lean. For economy jet the primaries border line lean and the secondaries rich. These carbs are very sensitive, make small changes and document everything You WILL get lost. So far, every complaint of misfiring over 10 psi (gauge) boost if not leanness is poor ignition. Being extremely over rich can cause misfiring also as can too much water injection. Over 10 psi requires more ignition power (not voltage) than a naturally aspirated car turning 10,000 rpm. Any not experiencing ignition problems are running low boost. After trying several systems; MSD, Allison, Judson, Chrysler, Perlux, etc., we converted to a GM HEI and can run 30 psi with no misfire. A perfect stock system works better than all but the HEI, if using a large coil, mag type plug wires, good bushings, .013 point gap, .022 plug gap and 32 degrees total advance. On hopped up turbo systems, the pressure retard system will be retarded all of the time. ***A 95 hp 4 speed distributor has the slowest and best advance curve.*** Use a detonation sensor

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and don’t worry about the advance curve. Develop you system in slow steps, detonation is deadly.

Misc Carb info

Subject: carburetor questions

I have recently rebuilt 1965 primary carbs and need some help. The all steel fuel valve I purchased from Clark's would not fit no matter how much I adjusted the float tang.

re: I use the GM original steel needle/brass seat. I find that the viton-tipped needles that come in modern kits tend to stick to the seat easily if there is any varnish in the fuel at all. Further, the steel/brass system should be self-honing, and shouldn't wear out for very high mileages. I've never looked at Clark's special one, and so don't know how it might or might not fit. How do I find out what engine these carbs came from? Well, the best way is to read the stamped aluminum tag that has the part number of the carb on it and then look it up. Unfortunately, carbs that actually have these little tags are really very rare, and so we have to resort to (ahem) other methods. Fortunately, the only reason you even care what the carbs came off of is so you know how rich the high-speed enrichment bushing is. You can measure this directly with small twist drills with a 90 degree bend in them (the smooth end is used as a go/no-go gauge). And then compare this to the chart published in the communiqué last year some time. If it turns out that these are 95 hp carbs, or similar, you will have to somehow reduce the size of the enrichment bushing in the carburetor so that the engine won't go excessively rich at full throttle when you have a 51 or 52 main jet installed in place of the stock 49.

Carb jetting:

OK, I finally got tired of all these half answers. This is the best truth I have available from the '65 shop manual and the June 1992 Communiqué (which has the article about the high speed enrichment bushing sizes). If anybody has the '65 Chevrolet Service News reprints, it would be worthwhile to check for midyear changes to the jetting, because I seem to remember some.

The '65 jetting sizes are:

	95 hp	110 hp	140 hp	180 hp (caution)
man	.051	.051	.051	.098
pg	.051	.050	.051?	N/A
a/c	.051	.051	.051?	N/A

140 secondary: .050

I strongly suspect that there was an early change to .049 jets in 95 hp and pg 110 engines. Somebody with the Service News can check that one out. for comparison, my '64 shop manual supplement showed .050's in everything but the 95 hp/man combination, which got .049's This was the last pre-high speed enrichment year.

1965 high speed enrichment bush sizes:

	95 hp	110 hp	140 hp
man	.034	.034	.034
pg	.034?	.040	.034?
a/c	.034	.034	.034?

1966 high speed enrichment bush sizes:

	95 hp	110 hp	140 hp
man	.040	.040	.040
+smog	.040	.040	.040?
pg	.046	.046	.046?
+smog	.046	.046	.046?
a/c	?	?	?
+smog	.034?	.034?	.034?

In mid 1966 smog cars had power enrichment deleted. If you correlate the '65 jet sizes and bush sizes, you will find that the bush gets smaller as the jet gets larger. So there is a real possibility of over-enrichment at high speed if you use 95 hp carbs on your 110 or 140 with 51 or 52 jets in it. While excess fuel is useful as a coolant for high power operation, the factory usually figured in some for this purpose, and so running this rich just costs you power and wastes gas. The '66 and later carb, incidentally, has a second air bleed in the idle/midrange circuit which causes this system to become non-functional as the main jet starts operating. This no doubt explains the fatness of the enrichment jetting on the '66 carbs.

Corsa 140 jets:

Assuming you are working with unmolested 66 Corsa carbs (7026023 primary & 7226026 secondary), most people live with 52's in the primary and 49's in the secondary (stock being the 51's & 47's you have). This fat jetting decreases the tendency to knock under heavy acceleration and doesn't seem to materially effect the gas mileage.

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Carb shafts:

The bores really don't wear much on these carbs, it's the shaft. You can buy new ones and, they seem to generally get rid of all the slop. Do be careful installing the new shafts, they're only brass (chromed), so can be bent rather easily.

More on jets:

1. I talked with Larry Claypool this weekend at the annual Tri-State Corvairs' Swap Meet, and he suggests using 52's in both primaries and secondaries of a stock '66 140. Warren LeVeque earlier had suggested 52's for the primaries, and 54's for the secondaries. I haven't had an opportunity to try either suggestion, but will sometime soon. I'll report my observations.

2. Also, regarding the comments on the Allison electronic ignition, I was the one several weeks ago who described my "early spark" problem after installing an Allison (actually, Crane Cam) unit. Upshot was the need to modify the supplied bracket to reposition the optical sensor on the point plate so the spark occurs when the rotor is aligned (plus/minus vacuum advance) with the tower contacts. I am convinced the bracket supplied with my kit (and probably many other kits installed in Corvairs) is incorrectly made, and causes the sensor to trigger the spark well ahead of the tower contact. Greg Hanlin is checking a several other Corvairs with standard points setup, using my cut-away cap, and I'd like to try my cap on a few other Allison-equipped distributors to see if my situation is unique. If there are any volunteers, I'll send my cap (with a window cut in the top between the center tower and the #1 cylinder tower) to you so you can see the position of the rotor when the plug fires.

Carb Adjustment Procedure

Didn't see any replies to your question, and even though I don't currently have any multi-carb vehicles, I thought I'd give it a shot -- I did help tune some British sports cars with dual SU's a few years ago. The UniSyn measures airflow through the carb and you use it to check that both primary carbs have the same air flow. You can also do it with the vacuum gauge -- what you are trying to do is make sure both sides are pulling the same vacuum.

From my novice and naive perspective, I'd suggest the following (I make NO guarantees...) I would start with the shop manual and go through it's procedure to make sure the carbs are mechanically synchronized. That is, they both shut/open simultaneously. Start the car, warm it up until it's at normal hot idle. Adjust the idle speed as necessary.

Then I'd use the vacuum gauge on each side (I assume there is a place you can pick off vacuum on each side??) to adjust the mixture -- this is going to be an iterative process by the way. Adjust the mixture screw for highest vacuum on that side. (As you go too rich or weak, the idle speed will start to drop causing the vacuum to drop.) Then go to the UniSyn and adjust throttle linkages to get equal air flow, go back to the vacuum gauge for mixture, back to UniSyn, etc., until you are happy. The idea is to get the air flows and mixtures the same. (Of course this doesn't do anything for loaded operation -- hopefully the linkages are not so badly worn that the throttles are badly out of syc as they reach full open conditions. This really shouldn't be a problem.)

There's an old trick to use the vacuum gauge to balance the two sides -- that is, get the same vacuum. What you have to remember is that bourdon tube vacuum gauges are really differential gauges. They measure the vacuum relative to atmospheric. If you put the gauge inside a jar and bring its connection out through a tightly sealed hole in the lid, then you are measuring vacuum relative to the air pressure inside the jar. If you then make a second connection to the jar (install a connector on the lid), you can hook the jar interior to one side of the engine and the vacuum gauge to the other side. That way you are measuring the difference in vacuums drawn -- on side drawing a vacuum on the interior of the jar, the otherside to the gauge. If the gauge reads zero, then the vacuums are equal, if not....

I have successfully used the carb sync procedure from the shop manuals for my '66 Corsa CT 140/4. You must have both the '65 and '66 manuals to do it by the book. What I mean is the '65 manual will let you sync up the primaries and the additional procedures in the '66 book will finish the job. The key is to make yourself a vacuum gauge set that is as follow:

1) From a standard vacuum gauge run a short piece of hose to a "T" fitting.
2) From each side of the "T", run a hose to the base of the primary carb. (I use the vacuum choke line port.
3) Make your self a device that will pinch off each line to the carbs. I use a small 6" visegrip pliers.

By following the procedure, and alternating the mixture and idle adjustment, you can "balance" each manifold to pull the same vacuum. Same principle as a UniSync which measures air flow. Equal vacuum on each manifold equals same or flow. Mine at idle is around 10-14 inches if I remember right (I balanced the carbs last December). All this assumes good carbs, no slop in the linkage, good electrical turn-up, etc. A small turnbuckle and 2 pieces of chain helps in keeping the RPM around 12-1500 as the book specifies for this procedure. Clip one end of the chain to the throttle cross shaft lever which attaches to the linkage rod coming through the firewall and the other to a convenient point on the rear body panel. By twisting the turnbuckle you can adjust the Rpms accordingly. It helps to have a portable tach connected to the distributor to set the RPM correctly.

Carb info :

The problem with the idea with that is that the Vair engine is airflow limited at the intake valves. That's why the 140 has bigger valves... Just bolting a bigger carb on is likely gonna just hurt driveability. Agreed, if you just bolt on a bigger carb you will drop your velocities across the venturi; not what we want to do. But, adding 2 more 'stock' carbs is another matter. Actually the 2 carb Vair engine is airflow limited because of the carbs, the valve area is sufficient to flow the cfm. Adding 2 [extra] carbs to a 2 carb engine is a very good way to improve overall engine performance. This needs to be a progressive linkage system.

Even before that modification very positive results can be had from installing a good dual exhaust system, removing the restriction in the stock air cleaner, 'tweaking' main jet sizes and installing top notch ignition components.

>You will have a MUCH better effect by switching to 140 heads.

True, the 140 heads will flow more air, but compromise lower port velocities below 3,000 - 3,500 rpm. A lower torque output follows. For a street driven car, given similar prep work on the heads, a 4 carb 110 based head will hold it's own vs. a 140 in normal driving conditions; especially in a PG equipped car. Now if you really want to twist the engine and go fast - you got to get 140 heads. Even, then the 390 cfm Holley

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(most commonly used 4BBL) is oversized for just about all Vairs.... Yes. It is a bit 'over carbed' but can be made to work well. It does need a bunch of 'adjustments'

Hv Flow carb capacity:

Q: Anybody know offhand what the Rochester H models can flow?.

A: 120 cfm @ 3" Hg, 80 cfm @ 1.5" Hg.

90 degree Carb rotators:

Not to start out negative - but here's a list of the problems... 1) The aluminum pads that fit between the carbs and the intake manifold (and thereby allow rotation of the carbs by 90 degrees) are too "short”. This results in major interference with the throttle arm on the LHS secondary and plug wire 6. On the RHS this also translates into a rats nest of carb connections and plug wires. It all works but it takes lots of fiddling and some machining of the throttle arm. They suggested a right angle plug lead on plug 6 but I doubt if even that would help very much. My rec. to Clark is to make the carb pads half an inch or so higher.

2) the choke connections are a bit hokey and the RHS vac break has to be relocated to a secondary which makes it even more hokey. My rec to Clarks is to make the heim joints 1/3 inch or so higher and leave the vac break on its original location on the primary. I don't have any ideas for the choke connections but they certainly could be improved.
3) there is no provision for a spring on the secondaries to return them to idle after being used. I mounted a spring on each secondary.
4) it would be preferable if they supplied a tube that connected the balance tube and the crankcase breather to the air filters. I made one but it could be improved and should be in the kit.
5) there is no setup/tuning info for example showing how to set up the secondaries, what jets to use, whether to idle on all 4 or just the primaries, etc,etc
6) I had a few missing parts(minor) in the kit. This is VERY unusual for Clarks in my experience. Now for the good news...after lots of fiddling it does work and the performance improvement is noticeable - especially while driving enthusiastically! I haven't got everything dialed in yet so I'm still tinkering. Also, the heim joint setup for the x-shaft is superb and I wish you could buy an equivalent for say a 110.
As I said before, the installation fit my 80-20-80 rule. Overall I'm happy but it could have been made sooooooo much easier with a few improvements. If anybody goes ahead(or has done this) perhaps we could share info ?

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DIFFERENTIALS

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Cleaning a Torque Converter

1. On the back side of the torque converter, alongside the ring gear, you will see a reasonably flat area where the torque converter casing is reasonably thick. It is about 1/8 to 3/16 inches thick at this spot. (I haven't done one for a few years so I am working from memory here.) Acquire a fine thread hex socket set screw in either 1/8 or 3/16 inch size in the shortest length possible. You need to use a set screw so that once installed, it is neither protruding inside or outside the case. Get the appropriate tap drill and carefully mark, center punch and drill a hole through the converter case exactly in the middle of the flat band. Be careful not to drill through and damage any of the converter internals or break off your drill bit inside the converter. This will be very bad! Next get a taper tap of the appropriate pitch and size to match your set screw. With the converter held with the hole down, tap the hole but only cut the threads deep enough that the set screw will sit tightly in the hole once it is centered in the torque converter case material. Do not overtighten it during your tap and test routine as you can stretch the hole and loosen the fit. Now clean your torque converter using whatever combination of solvents you prefer. You can install the set screw plug while you swish the solvent around inside to keep from making a mess. Now to drain out the solvent, just remove the plug and let the assembly drain out your new hole. Once you are satisfied that you have removed all of the detergent and any dirt that may have made its way inside, you are ready for the final step.

Next it is recommended that you pour some clean ATF fluid into the converter and use it as a rinse to remove any solvent that is trapped inside. A couple of cycles should get rid of it all. Next place the converter so that the new drain hole is up. Religiously clean away any ATF fluid from all the threads. The use of compressed air and a small bit of lacquer thinner or suitable solvent based degreaser is recommended. (Brake Cleaner works well too.) Make sure you also degrease your set screw.

Now place some medium or high strength Loctite thread locker on the set screw and case hole threads and install the set screw. Make sure it is snug and properly centered in the case. It absolutely must not extend inside the torque converter and must not protrude externally so as to foul the starter drive. You now have a clean torque converter that is ready to go! In spite of the odd warning I have read not to do this, I have done a number of cars over the years and never had a problem. As long as the set screw fits tightly, is cleaned properly, and installed with thread locker, it will not come out. If you are ultra paranoid you could have it spot welded to the case but there is really no need. As for affecting the balance of the unit, the small amount of material difference that may occur is totally insignificant. A bit of grease and dirt or a small stone stick in the cooling shroud is many times more of a problem. The other nice feature of this plug is that it is removable and it gives you a convenient method to change ALL of the ATF fluid when you want to service your tranny.

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Transaxle Saginaw swap:

If you want to put a sag trans in a 65 you need to change the following:
1. **Saginaw transaxle** (trans & axle) 2**. input shaft** 3. **trans crossmember** 4. **stabilizer rod** at shift tube..about 10 inches long 5. **u joint clamps and bolts** it's a pretty simple swap, but not important in a street car..

Differential adjusting:

The way to set up the differential if you don't have the special hardware is to start with the shims that were in the differential originally and record the pattern and work the shims toward the ideal pattern on the ring gear teeth. I started at 0.012 in thick shim and ended up at 0.021 with a backlash of 0.003 in. and a centered pattern nearer the toe of the gear so that wear-in would more center the pattern for longest life. It's not the perfect way to set up a differential, but if I can do it, anyone else should be able to. BTW, you can use feeler gauges in lieu of a dial indicator. The dial indicator is a little easier to work with.

Transmission Oil Leak:

There are generally three places on the transmission for leaks. Make sure that the tranny is securely bolted to the dive to eliminate gasket leaks there. Tighten the shifter cover bolts. There is a seal where the shifter shaft enters the transmission. The seal is available through the normal Corvair parts vendors. The differential has two seals where the axle shafts come out, a seal where the input shaft enters from the clutch (you have to pull the engine for this one), and a gasket on the top of the differential.

Bolting your own Flywheel:

1) Bolt your own- easy to do. I buy the bolts at an aircraft supply house- and drill off the old rivet heads - and use a drift punch to remove them one at a time replacing them with 1/4" aircraft bolts/locking nuts.

2) I remove the rivets and use 7MMx20mmLGx1 pitch bolts. After removing the rivets I tap out the hole with a 7mm tap (which is the perfect hole size). Then I screw in the bolt and torque it, and add a LW and nut. It workes better than a 1/4" because it is slightly oversize.

3) If I may add a comment here, what is being recommended works vwey well on a new or still tight flywheels. But if the flywheel is really loose, or has been run for a long time in a loose condition, then the three parts of the flywheel will tend to shift position and wear grooves in the little rivets. If that happens, the rivets will hang up and be hard to punch out. That is: impossible to punch out unless the three parts are properly and carefully aligned. If that is the case, you may have no choice but to remove all of the rivets and align the pieces prior to installing the first bolt. And also be careful about which bolts you use since those with normal size heads might cause the heads to contact and rub against the four lower bolt heads holding the bell housing to the crankcase. So be sure to check for at least 0.100 inch clearance there.

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ELECTRICAL

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The Best Battery

I can't tell you who makes the best battery or what will fit in an early model but I can tell you my experiences with batteries in a late model. I have a 66 Monza Cvt which I bought in 1994. Shortly after I bought it the battery in it would not hold a charge. Not having any paper work for the battery in the car I went to Pep Boys and bought the biggest battery which would fit into my car. It was rated at 1000 CCA if I remember correctly. It had top mount terminals and two covers which you could remove to add water to the battery. I had this battery in the car for about 2 years when one fine day I opened the engine compartment to check my oil level. What I found was two melted choke pull off's parts of my carbs eaten away, a stained and pitted chrome air cleaner cover, and a nicely bulging battery. After getting home I found that my external voltage regulator was allowing the alternator to charge at about 20 volts! Not a good thing. I immediately replaced the voltage regulator and cleaned the engine compartment with baking soda and lots of water and replaced the damaged carbs and choke pull offs.

After that I bought an Optima battery. These batteries are often referred to as Jelly Roll batteries. They looks like a 6 pack of beer, or soda for those of you under 21 ;-) The acid in the battery is in a gel form, and the plates are sheets of lead separated by a fiberglass mesh. Each of the cells in the battery is rolled into a cylinder. The battery is one of their "Red Top" models and has both top and side terminals. It fit perfectly in the car. I think it is rated in the 800 CCA range. The reason I bought this battery is that it never needs any maintenance, does not vent any gasses, cannot spill any acid, can be mounted in any position, is very vibration resistant, and it was the hope that I would never have the problem again with spilled acid. So far so good. I've had the battery in my car for a number of years now with no problem. Another thing I did was install an internally regulated alternator and also placed a battery mat under the battery (for extra insurance) to soak up and neutralize any acid.

Where to connect Heater Blower

Larry Claypool wrote an excellent article that describes how to add a relay for a hi-volume heater blower in a non-AC car (see Tech Guide, pg E&S-20). The relay only comes into play when the fan switch is in the "high" position, i.e. when the blower motor is drawing the most current. Larry ended the article by saying that "...I excluded late models with air conditioning from this conversion... While installation of a high speed relay on a late A/C car isn't impossible, it would certainly be more complex. I'll leave that one to someone with more time than me." The '65 manual actually shows how to wire a high speed relay for late A/C cars (Fig 60), but I'm not sure if the relay ever made it into production. There isn't one in my '65 with factory AC and the relay isn't shown in subsequent manuals. You should be able to add a relay to your '66 by comparing the '65 and '66 manuals. Use a SPDT relay with a high current rating (about 30 amps). As far as the new 10 gauge wire you added, run it from the heater blower motor to the switch on the Air Select lever. Replace the UPPER 12 B/OR wire as shown in the '66 manual with

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the new 10 gauge wire. That only thing that does, however, is bypass one connector.

The addition of a relay per the '65 manual requires the relay to be fed from an "always hot" source, i.e., one that's tied directly to the battery. The new aux fuse panel you added would be a perfect source. Use about a 25 amp fuse to the relay. BTW, I hope you fused that 2AWG wire as close to the battery as you could using a fuse slightly larger that the maximum current you expect the wire to carry.

Corvairs Need Good Grounds

Usually people follow the traditional positive part of the battery circuit through to the ground terminal and only then find the problem after spending either excessive labor and/or parts dollars. Starting at the ground end is VERY fast and eliminates many of the really nasty intermittent problems. In fact for ANY intermittents, definitely try the ground first. would suggest a few possible enhancements. Purchase a newer style 10 to 20 amp flat bladed fuse (easy to see if it is blown) and socket with plenty of spare fuses. Wire a LONG (maybe 20 feet or more) heavy 14 gauge or smaller gauge (bigger wire) to a bulldog clip and to one end that will grab securely to the negative terminal of the battery. Connect a wire about 3 feet from your "test end" of the other fuse lead so you can check the fuse frequently. Now you can ground anywhere from the right front headlight area or dash and anywhere else on the vehicle. Mount a high quality clip lead to that test end and also have a ground probe you can clip to for getting through the grit, corrosion, etc. The fuses are low enough resistance to do the job, but just may save your electronics or expensive wiring from being fried. Safety tip, don't hold the fuse, just in case you put it on +12 volts and it decides to light up. No, I didn't find this out first hand, thanks.

Second thought enhancement for those that like wearing belts and suspenders: Wire a small +12 VDC panel light across the fuse. If the light ever lights up, you have blown the fuse by "grounding" +12 volts. Replace the fuse and be more careful next time.

Replacing those cheap plastic bulb sockets (taillamps)

The **metal sockets** in question (that fit Mopars and GMs of the '60s-'70s) are readily available as GP replacements across the counter, but I get mine dirt cheap by cruising junkyards armed with a pair of diagonal cutters and directions to the Mopar section. A big heavy Chrysler New Yorker from the late '60s or early '70s will yield up a batch of metal tail light sockets that will last practically forever and never have any ground issues to worry with.

The late model 'Vairs currently here have metal Mopar sockets in them and I'm never bothered with light problems. Dab a glob of wheelbearing grease into the socket before you squish the bulb into it and it will never corrode or oxidize no matter how much water you spatter onto it during washes etc... or trunk/decklid leaks. And if the bulb burns out you can remove it easily without a fight.

Alternators

Most rebuilders part #'s for the internal reg alts are in the 7100 series. Most common being the 7127-3. The "-3" signifies the "clock" position, or the relationship between the front half and the back half of the alt, so it really doesn't matter much. A 7127-3 is the same as a 7127-9, except the back half is turned 180 degrees. Pretty scientific huh? As I recall, you can get up to about 65 amps output from cases that will mate with the Vair, but the most common are 35-45 amps. You will hear rumors that it's hard to get the back half back on due to the brushes falling out but there is a really simple way to do this.

With the back half off, install the brushes in their holders then insert a paper clip through the little hole that GM put there for just this purpose. It will hold the brushes in whilst you reassemble. once you're all bolted together, just pull the paper clip out the back and viola! Nice thing about these is you can assemble in any clock position you like for ease of access. Happy Vairing!

ENGINES

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Easy 140 hp tips:

Add an electronic ignition, hot coil, silicone wires, Bosch W8AC plugs gapped at 0.045-0.050. New cap and rotor with brass contacts.
2. Set the timing at full advance vice idle and use as much advance as you can without spark knock.
3. Use a set of 2" Walker Super Turbos in place of the stock mufflers.
4. Raise the stock air cleaner assembly 1" off the carbs using exhaust adapters, add a new paper filter, and flip the top cover.
5. Make sure all 4 carbs are opening fully.
In addition to Bills suggestions.....re-jet the carbs to one size larger jet. IE 51 to a 52, etc. As far as "timing"...I personally feel the stock "curve" [weights and springs] are set for "wimpy" performance......depending on the VA too much. I change the springs [ACCEL recurve pack for GM dist.] for faster mechanical advance....IE 32 degrees TOTAL [initial and mechanical] @ 3,000 rpms.
1) Increase exhaust flow - not noise = larger pipes and less restrictive mufflers
2) reduce intake restriction - air cleaner upgrade
3) upgrade ignition system - US HEI package -
4) minor carb modifications - 4 primaries with high speed enrichment feature - larger main jets and linkage tweaks next step would require engine disassembly and $$

Re: 140 HP horsepower

Jim, I sure agree on this one. Chevrolet did do some dyno tests on this combination. But the performance was not really improved. The curve that I have a copy of is a Gross Power test. It shows the torque of the 140 w/304 to be below the 891 cam below 2400 rpm. As much as 4 ft-lbs below at 1600 rpm. From 2400 to 4800 the torque is about the same. But the 304 engine goes out to 5600 compared to the 891 engine that stops at 5200. From 4800 to 5600 the 304 engine has slightly more hp (1 or 2 hp).

But the 304 cam was developed for the turbo engine, and never intended for the 140 engine (except as a replacement). The main feature of the 304 cam is better valve-following. Especially at the higher rpms. My belief is that the Chevy engineers thought the turbo engine would be a "performance engine" whereby the 140 would still be a "cruising" engine. It was available in everything except the FCs. It's been so long

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ago since I looked, but my memory tells me that the redline on the tach in the Corsas was different for the 140 hp engines from the TC engines. The redline on the turbo was several hundred higher. Anybody able to confirm that?

Improved cooling

If no one has told you yet, the greatest cause of Corvair engine heating is due to casting flash in the fins in the heads. If you can, remove the top and bottom shrouds, and clean out the air passages in the heads. I use a keyhole saw, poke it down through each passage and saw to the end of the slot, turn the saw around and saw to the other end of the slot. It is difficult to do with the heads on, as you have the cyl studs and pushrod tubes in the way, but you can make out. You will see what is supposed to be a large hole through just above the spark plug. It may have a piece of flash passing through the middle of it. Knock it out, and go after it with a 3/8" rat tail file. This hole is supposed to supply the air to cool the top of the combustion chamber. This has three fins that are visible from below, and sometimes have a roof of flash over them, making them totally ineffective. I use a long screwdriver to pry this flash off. You may not be able to work on this because the exhaust manifolds may be in the way. I don't remember this part too well, as I do this with the heads off. This cleaning process is a must for anyone who has an FC or UltraVan. I have both. It will make your engine run at least 50 degrees cooler. From mid-spring to mid-fall, run with the bottom shrouds off ESPECIALLY up the grapevine.

Dropping 140 Valve seats:

I will repeat: I have never seen an untouched, UN-overheated Corvair head of any type drop a seat (have a 155,000 mile pair on my '65 right now). Therefore, machine shop work and/or overheating are the culprits. This doesn't mean that you can or should avoid machine work on the heads, but it does definitely mean that you should be careful, and think ahead a little further than GM did when they designed and manufactured them. 1. Never have a machine shop reface the intake seats on 140 heads. You are more careful and more accurate with grinding paste at home anyway. It is theoretically possible that the seats could be refaced with a power grinder if small cuts were taken and the seats not allowed to get hot enough to work the metal around them. I'm not sure I would trust anybody in a time-is-money environment to take this approach. I will further note that most of the time all you need is a little circularizing of all the seats anyway--they're very hard alloy, and don't wear much in use. For these purposes two sizes of grinding paste and some time are better than all the world's power grinders. 2. If the valve guides are worn (as they usually are) and you decide to replace instead of sleeving or whatever, then go to bronze guides. Remove the iron guides by heating the head in the oven to about 300 F, oiling and driving out with a centering punch. This will prevent galling of the guide bores in the head. The new guides should be cold--at least dry ice cold, and the heads should be at least 150 F (preferably about 200 F) when you press/drive them in. Dip the guides in assembly lube before you freeze them. This will prevent a) galling of the guide bores in the heads, and b) upsetting of the head metal during installation. Bronze guides are recommended because the thermal coefficient of expansion of bronze is much closer to that of aluminum than the stock iron material is--this makes it less likely that the guides will wander in the heads after installation. 3. Don't run exhaust valvestem seals. This will keep the exhaust guides from wearing. Exhaust valvestem seals don't do anything but prevent a little puff of blue smoke on startup. Intake seals, unfortunately, are necessary if you're to avoid carboned-up intake valves. 4. Use roller-tip or full-roller rockers (see the archives c. six months ago). These basically eliminate shear loading on the valvestem and dramatically reduce valve guide wear, especially when using stronger than stock valvesprings. This means you won't have to do guides again for quite a while. If your 140 heads have been previously machined (as most have), look into one of the positive seat retention systems out there. Threaded and pinned seats are the most positive installation, because they cause the seat to be retained with some sort of mechanical interference. A good thermal press-fit should last well if done right.

140 Dropped valve seats:

Q: I have a 140 head with a dropped valve seat (big surprise right!). I have heard that it is possible to get these repaired and actually have them reliable (as much as they were to begin with anyway). What processes are used? Does the newly applied metal (Al) form a strong enough weld with the old to hold the new seat and be reliable?

A: The first thing you have to ascertain is whether or not you need to weld the head up before putting in a new seat. If it needs welding, then the head has to be preheated to 3-400 F and then welded with a square-wave 600 amp heliarc. This is not an especially common item, but if you can find somebody with one, they *will* know how to make a good, strong patch on any head problem you can imagine, because this piece of equipment is specialized for this kind of use. You will then have to have the seat installed. 140 intake seats have been a problem for long enough that several different fixes have been developed. The simplest is to stake aluminum around the seat so that it doesn't fall out. My father swears by this one, but it scares me a little, and I worry about the possibility of hot spots from the sharp ridge of raised aluminum. Another popular option is to install the seats like the factory did, but with more shrink: The head is preheated first, the seat supercooled, and a greater than stock press fit applied. This should give very good durability if properly done. Other, more exotic options include screw in or pinned seats. Both of these are certain to stay put through just about anything you can do to the engine. These treatments are, of course, more expensive.

Regardless of what technique of seat installation you use, it should be applied to *all* of the intake seats of both heads of the set in question. If one side of the engine dropped a seat, then the other head was probably subjected to the same stresses, and will probably fail soon as well. The common causes of dropped seats are high head temperatures, seat pounding, and having the seats ground. High head temperatures cause the seat's press-fit to decrease. I have seen several 110 heads with dropped seats caused by this, as well as 140s Valve pounding aggravates this problem by hammering the aluminum around the seat into a larger size, so it's important to retain stock valvespring strength and cam rates with stock heads, and to avoid overrevving (no, you don't have to drive like my grandmother, though). Moral: make sure you deflash the heads, and keep the engine in good general shape. Popping fanbelts at full song is a quick way to overheat the engine...

Having the valveseats ground during a rebuild seems to be a sure-fire way to drop seats. The grinding heats the seat and applies a torque. Meanwhile, the aluminum around the seat is cold, and so is pressed away from the seat as the seat expands, reducing the press fit. If you want to reshape your valveseats during a rebuild, use hand tools and lapping compound only. The valve seats on a 140 are big time trouble. after the valve job I would stake them as you suggested. I would also clean up the combustion chamber

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afterwards as you don't want any sharp edges. When we built my engine we went the extra deep valve seat method.

Regarding staking valve seats:

My take on it is that staking, if done properly, actually pushes a small lip of metal over the outer edge of the seat, thus positively capturing it. If you have a set of heads that a) were properly assembled, b) have never been overheated, and c) have never had the seats ground with a power grinder (which preferentially heats the seat more than the head, relieving the interference fit), then you're likely to have the original .004" press fit, even on a 140 intake, and don't need to worry.

The bad news is that there's only one way to be sure that's the case these days (unless you bought the heads new and know their history): remove the old valve seats and press new ones in with the proper technique, then treat the head well in use. People who try to escape this step usually do so at their peril. There are many original heads out there that have never had the seats ground and have never been overheated. But how do you tell? So there's a steady market in positive retention techniques. Pinned seats, staked seats, threaded seats, etc. And seat staking is the one head retention technique that nearly anybody can do in the garage. So it's popular. Is it effective? Durned if I know. Logically, it could be, given how easy it is to upset the soft aluminum of the head. I've observed that the seat does in fact shift around in its pocket during staking (requiring some time with grinding paste afterward). Empirically, papasan hasn't had a 140 intake fall out since he started staking seats. But I would not dare call this a scientific sample with controlled conditions.

Things I am willing to say:

1) it's not a turbo or 140 head, and it survives an oven test, it's probably OK, and doesn't need staking. The small-valve heads never had much of a problem with dropped seats unless abused.

2) Be very careful about having the seats ground in a Corvair head at the machine shop down the street. If the usual green stone cutter is used, these generate a lot of heat in the seat, destroying the interference fit as the cold aluminum cylinder head is pushed away from the hot valve seat. Water pumpers with aluminum heads don't have a problem with this because the head only gets up to 200 F when operating. Ours see 450 F on a regular basis, making the difference of coefficients of thermal expansion (and the starting interference fit) a much bigger issue. Since Corvair valve seats are all stellite anyway, it's rare to see one that needs serious work—the valves are much softer, and wear preferentially. You should be able to accomplish what is needed by having the valves ground (if necessary), and then using the traditional grinding paste and sucker stick to ensure that valve and seat have even contact. **3**)If you bought a set of turbo or 140 heads with no known history, just assume that the seats are about to fall out and have them replaced properly, or expect them to do a Murphy on you some lonely night. **4**)Is the cooling system on your engine working as designed? Perimeter seals and all sheet metal in place? If you've never had carburetor icing in cold, wet weather because you forgot to flop the plate (or bend the tin, if it's an early), you probably need to do some work to ensure that the hot air stays UNDER the engine, and the cold air above. **5)** Put some kind of temperature gauge on your engine, and get used to its normal behavior. Oil temperature gives fair warning of overheat in nearly all conditions. The generator light (GEN FAN) only tells you when the belt is broken, not when it's slipping. And the overheat light (TEMP PRESS) tells you it's time to buy a new engine.

Sparkplug lube

That was a good topic for the tech session. Corvair people and other owners of cars with aluminum cylinder heads would be interested to know that piston engine aircraft manufacturers such as Lycoming and Continental all advocate the use of graphite lubricant for spark plugs used in aluminum cylinder heads. Champion Spark Plug company makes a liquid based graphite spark plug thread lubricant that comes in a small bottle with an applicator brush inside that is a lot like a bottle of finger nail polish, except that the consistency of the liquid graphite in the bottle is like thin paint. This spark plug thread lubricant is intended to be applied each time spark plugs are removed and re-installed which is usually at 100 hour intervals in most piston engined aircraft Even the FAA recommends graphite thread lubricant as a prevention of galled or stripped threads in aircraft engines. The Champion Spark Plug Lubricant can be purchased at most local aircraft service centers and aircraft supply stores. To prevent thread galling from rough threads on new $1.50 apiece spark plugs, dress each new spark plug on a rotary motor wire brush to remove the manufacturing burrs. Even brand-new $30.00 apiece aircraft spark plugs have burrs on their threads.

Please do not stack head gaskets

The compression loading will cause them to fail. I prefer to use a stock 0.032" thick. head gasket and stack cylinder base gaskets available @ 0.015", 0.022", and 0.032" thick. instead.

Finding Top dead center:

The most fool proof method I have found that I will put up against anyone else's method is, Get a piece of hose about two ft long that is the right diameter to screw into the chosen spark plug hole. Put the other end in your mouth with your tongue against the opening. Turn the engine counterclockwise with a 3/4 wrench on the crankshaft/damper bolt. There will be no question or doubt in your mind when that piston is coming up to TDC. No removing valve covers. No pulling distributor caps. Any idiot can do it as I have proven many times. Another way (and it was just a thread a few days ago) is this: every self-respecting CORVAIR mechanic should have a remote starter. It is easy and cheap to make from a push button starter switch available in any parts store, two lengths of wire and two alligator clips. Clip one to the positive side of the battery and the other to the purple wire going to the starter, make sure the engine is in neutral and push the button. This will come in very handy when you adjust the valves cold like Ken and I have been saying for a long time. NOW TO FIND NUMBER 1: remove the number 1 spark plug, put your finger into the shroud and press against the plug hole and bump the engine over, when the piston starts to come up on the firing stroke you will feel the pressure on your finger and then you can roll the engine on around to the timing mark with a wrench. I PROMISE THIS DOES NOT HURT!!

Head gaskets:

This subject comes up from time to time, and usually the answer is the same, rounded part towards the barrel. ***Reply*** : Dan the raised side goes toward the jug as you surmised. The raised side will crush down and conform to any irregularities of the much harder jug. If no one has installed them incorrectly before then the flat side will have no problem conforming to the softer head surface. If someone has screwed up the head by putting them in wrong I would loan you my gasket seat dressing tool. As for

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using copper gaskets: I wouldn't claim the three gasket failures I have had to contend with are an established trend. Fact is though, they were all copper. Have never so far seen a failed steel gasket and that includes a bunch of teardowns just to get the parts. Hello ***Harry:*** The trouble with putting the crushable side against the soft aluminum is that the aluminum will be deformed by the curved portion of the head gasket. If the gasket is placed with the flat side towards the soft aluminum, the crushable side will be against the harder cast iron cylinder. I think that a part of the reason that the head gasket register needs to be resurfaced on some heads is because the head gasket was placed backwards.

Retorque head nuts:

My method looks basically like yours. I torque the heads to something like 30 lb-ft, test fire the engine, get it hot, adjust the valves, cut it off, go in and get dinner (it always seems to be dark by the time the test-firing happens), and whenever it has cooled completely, I crank the heads up to 35 lb-ft. The reasoning here is that there will always be enough additional torque requirement to beat the static friction of the nuts. I also don't set the French locks on the exhausts until after a retorque of those after the first firing.

An additional comment would be that "things" don't slide well as they are being torqued down. Once cycled through a few heat cool cycles a certain amount of settling can occur. This is more likely to occur on used parts where the machined surfaces and interfaces are not as perfect ie. "smooth" as they originally were. Add to this Rad's comments and you can understand why some loosening can occur. As for overtightening, this is poor compensation as you may cause actual distortion of the parts which will then add to the typical loosening that can occur. This effect is most noticeable with the exhaust manifolds where even if you torque, hammer, torque, hammer etc. while cold until specs are reached, you will quite likely find that once they have been heat cycled a few times that they can be down to half the previous torque. Having had a few gaskets leak and blow out over the years, particularly turbos, I go overboard with the following technique: 1. Torque the manifolds to spec. 2. Start up the engine and once the engine has warmed up crawl under and retorque again. I usually just let the engine run and enjoy the warmth. Of course the rear end is supported off the ground and supported properly. 3. Keep doing this until the manifolds reach a stable torque which can sometimes take three or more hammer and retorque sequences. You will be amazed at how much further retightening is often required. (By hammer, I mean take a block of hardwood and a hammer and use this to settle the manifold further into final position. Again, this is required because parts don't like to slide as easy when under pressure. Also, the three or more cycles holds for the standard gray type packings which do compress quite a bit once they get hot.) If you do this once you will probably realize that retorquing your cylinder heads after they have thermally cycled a few times is probably wise insurance. This extra fussiness has saved me gasket related problems 100% since I started doing it but it does take extra effort but then again as the old saying goes, "Not enough time to do it right but always time to do it again." Hope this helps you out.

Chipped fins on cylinder or heads :
This is a tough one to answer because what really matters is how hot the offending cylinder will be, say as compared to the other five. Since you don't have the easy means to instrument each cylinder with thermocouples, then you have no way of knowing. If the chip is on the head-end of the cylinder, that's the worst place because it is the hottest. If the chip is closer to the crankcase, well, that's better. A chip on an aluminum head fin is the worst (especially near the exhaust port), followed by head-end of the iron cylinder, and so forth. The fin lengths were made shorter toward the block end of each cylinder to regulate the heat transfer and maintain a heat profile down the length of the cylinder. Therefore I would say that generally a broken fin in one place is as bad as a broken fin in another. I have seen so many broken fins that I also am reasonably convinced that the engines were originally assembled with broken fins. In other works GM didn't worry about it. On the other hand, Anil is talking about a pretty big chunk(ie 1”square). Skipping over the theoretical analysis, going straight to the practical advice. One with a missing piece half that size I would just reuse. For one that big, I would find another cylinder if I could without a lot of expense or trouble. If I reused it, I would position it at one of the cooler running cylinders. Without attempting to instrument it with a fist full of sensors, I would assume that to be on the right side and take the front cylinder. The left rear runs hottest due to the oil cooler and that whole side runs hotter than the right. By observation: When an engine has two good thermostats, the left opens first. End cylinders run cooler than the one in the middle. The front has no extra attachments to generate or hold heat.

Deflashing and cleaning oil galleries:
I have a few of those articles around and can give you the gist. On the cleaning the galleries, use a gun cleaner and pipe cleaners. Make sure that the two halves when together line up good (this means the path between the two under the main bearings (the channel)). Open (with a dremel tool) the hole into the main bearing channel. This will promote good oil supply to all bearings. On The engine seal advice, use vitons. Also use the foam kits available as this helps with routing. You will gain far more if you just clean up the fins on the jugs and the heads. (this can be done with a screwdriver/hammer/hacksaw). Use the hacksaw to cut the leftover metal in the fins of the jugs (you'll know as it looks like it doesn't belong. just don't go too far. I backlight with a flashlight to see what I am doing. On the heads do the same thing, using the screwdriver/hammer. There is supposed to be a passage between the intake runner and the chamber. clean up and straighten fins as found. On the breaking in the new engine. the advice varies. the constant is: 1. Prime the Oil Pump with a drill and an old distributor shaft Use ONLY a Non Detergent Oil such as ND-30 found at Pep Boys 2. Check and Double check EVERYTHING before the go for cranking. 3. Once started, run at varying RPM's above 1,000 for approx. 3 minutes. Shut it down and change the filter and oil immediately. 4. From here opinion varies Some say the next 50 miles others say 1,000 miles. Drive at varying speeds with little or no idle or constant extreme (i.e. Highway). After that you can move to a detergent oil or synthetic.

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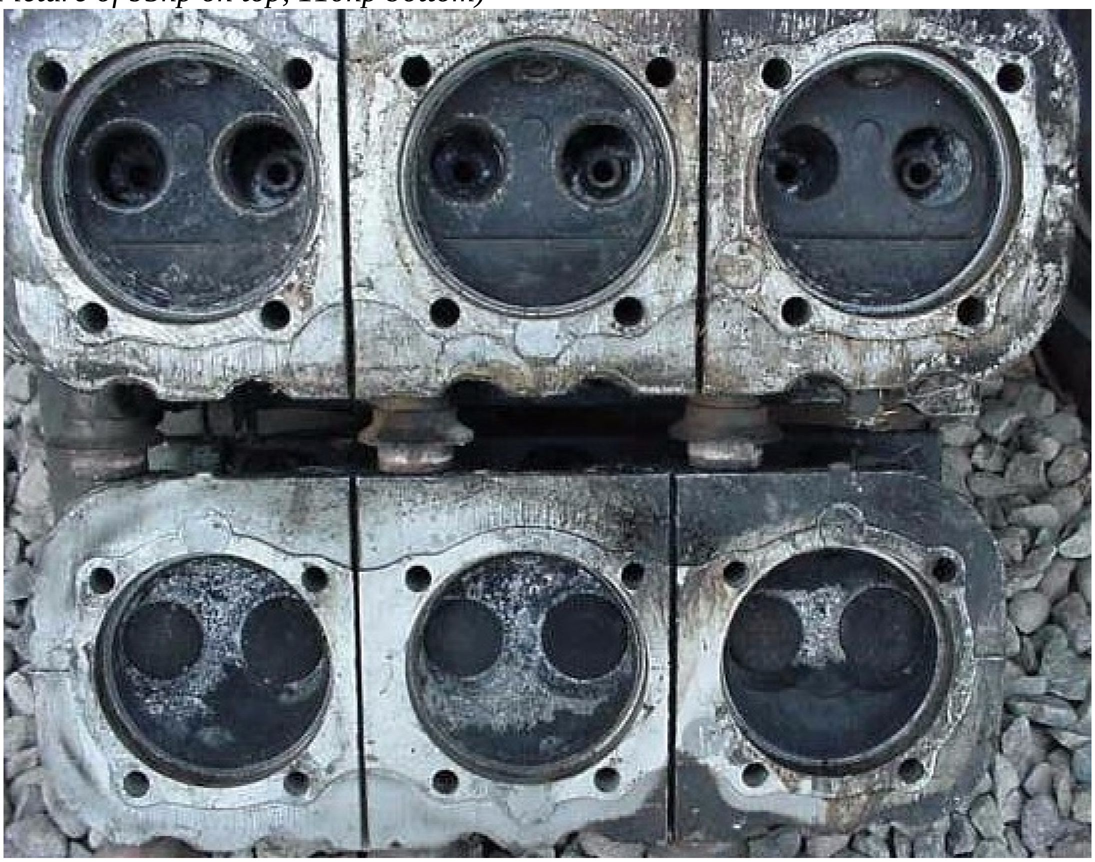
95 heads vs 110 heads: with the

95 hp heads vs 110 hp heads: about 5% power and 20% more fuel economy.
The 95 fuel economy comes from the cam, not the heads. The 95hp cam has very little overlap; the 110 has about 30degrees. This is where the fuel economy goes. Further, the lower compression ratio of the 95hp heads gives an inherently less efficient engine- physics and all that. 110hp heads with a 95hp cam gives even more thermal efficiency (but use a 110hp distributor- the advance curve is determined by the shape of the combustion chamber), if low-end output is what you want.
(Picture of 95hp on top, 110hp bottom)



Seal Block:

You should put a little sealer on the corners, where the top, bottom and ends aren't covered by the pan, top cover, bellhousing, or rear housing. I prefer the Loctite 499 UltraGrey (I think that's the number) sealant used on Japanese engines for sealing cam housings to the heads, etc. The last engine I did this way was done 10 years ago, and the guy who has it still has no oil spots under his car!

Adjusting Valves :

Don't forget that the "U" stamped on the push-rod guides MUST face out. Holes on the pushrod tubes are up. UP means on the head side, and not pointing toward the crankcase.

Engine rebuilding

I'm one of those guys who has always had to limit my hobby $ in order to keep the kids fed, but I'm a pretty good mechanic, too. I pursue cost effectiveness rather than "perfection". Some of the wear parts in a Corvair engine will go indefinitely. I do not automatically replace pushrods or rocker arms- I do inspect them WITH A

MAGNIFYING GLASS and only replace those that show irregularities. Corvair camshafts run partially submerged in the crankcase oil, and so wear very slowly. You can get cams based on modern technology that run better than your old one, and a new cam makes sense in that context, but I do not believe the cam to be an "automatically replace" item. The lifters- yes. And don't try to skimp on lifters- pay what it takes to get good ones!

On the heads, either get oversize valves and ream the guides WITH AN ADJUSTABLE REAMER to fit, or replace the guides. On an 80hp engine, fancy materials are not necessary, but bronze exhaust guides won't hurt a thing, either. Again, ream the new guides (they'll actually shrink slightly in the head) with an adjustable reamer- a "standard size" reamer will almost certainly leave you too much clearance. I've covered a lot of controversy already, but here's some more:

The pistons in an 80hp engine may be reusable under these conditions- if you have had the engine all its life AND ALSO IF it has never had a chronic stretch of overheating, you are not taking too awful a risk in re-using them. "Inspection" won't tell the story on your pistons- you only know the story if the engine has been yours all its life. UNDER ALL OTHER CONDITIONS, REPLACE THE PISTONS! 98, 102, 110, 140, and 180 cast pistons will eventually break at the oil ring groove. The cylinder barrels tend to go square under the influence of the four head studs, but the cast iron seems to take a "set" that way- so rebore your old barrels for the new pistons. Some machine shops can't hold the individual barrels in their boring machines (I had to make a special jig for the shop I use) so you may have to shop around for this service. Try a motorcycle shop.

Don't put the crankcase top cover back on without a new bearing in it. The fuel pump eccentric is chrome plated, and will last indefinitely, but again- inspect it carefully! The oil pump gears can be turned over so that the meshing faces are new to each other- but maybe this IS going too far to try to save money.

Leaky Rear Housing Studs

I would look real closely at the oil pump idler shaft; much more like to leak from there than the rear housing studs. the rear housing gasket surrounds the studs, and they are not exposed to any pressure areas, whereas the idler shaft gets full pressure and supply. we find they will start to leak after engine and oil temp is up to normal range. fix is to drive out the shaft, and re install it with red loctite. plastigauge pump clearance when you put it back together, adjust with different thickness pump cover gasket

More on Leaky Rear Housing Studs

If your problem persists, it is possible that the oil is seeping through the stud threads in the block. I have had this happen on other bolts that were loose. Normally, these studs should not come out when the nut is removed. They were put in with an interference fit. Since your studs obviously come out easily, I would think that may be the problem.

If your current approach to fixing the problem doesn't work, you might want to try sealing the stud threads. That can be done by removing the rear housing and get it clean along with the block stud thread holes. Put a straight edge on both the block and rear housing to make sure they are true, especially near the seeping studs. Check the studs and block threads to make ensure they are not striped. Everything OK to this point put some loctite on the threads (Loctite makes a blue type will provide some fill for the threads). Thread in the studs to the proper length. Let the Loctite cure. Then install the rear housing with a new gasket with either Permatex or Silicone on both sides of the gasket. If you use Silicone, clean the surfaces well with Acetone to remove any oil residue.

The last time I had trouble with oil leaking from those four lower studs, it turned out to be the block-to-rear-housing gasket, rather than the studs themselves- the gasket had split at one of the holes the stud passed through. Remember, there are oil pressure passages in the housing. Also, keep an eye on the upper end of the oil pump idler shaft- sometimes that will seep a little.

I have always adjusted all CHEVY, VW/PORSCHE, anything else with hyd lifters cold. It is easy to do, just watch the two rocker arms as the valves are closed, take the play from the rocker arm (a fine line I admit) and then tighten for preload of the lifter. I use 1/2 turn typically for customers engines, I only use 1/4 turn for my own stuff.

All the preload adjustment does is makes sure that there is pressure against the rocker arm so the rocker arm doesn't clack when running. How many of you readers can remember a time when a rocker clacks on a turbo car, the exhaust bark is completely different than when the lifter pumps up and quiets the rocker arm. Also Bob Helt's comments about the way a lifter works in his post below is very good on explaining the changes that happen to a lifter during high rpms.

I think that the method of adjusting the valves is best left to the 'whatever works best for you' theory. Remember however that if you are adjusting the valves with the engine running, only take the clack out of the rockers (which amounts to the same as my method above), then shut the engine off and wait a few minutes before making the preload adjustment, otherwise you run the risk of bending pushrods because the lifter is really pumped up at the zero point. At the very least many of you will remember that the engine missed a bit if you quickly tightened the preload into the rocker, that is because the valve is being held open for a few moments.

Also many times the valves are being adjusted because of a click/clack that will end up being things such as a worn rocker arm, worn guide or even an exhaust leak. When you adjust the valves on a hydraulic system, it should not need readjusting until service is done or parts start failing.

Adjusting the valves 'loose' as in Chuck's post below is not exactly an idea that I would use for keeping valve seats in place. Valve seat loss is most generally a factor of heat/cool expansion and contraction between dissimilar metals. I doubt that running a 140 engine with 1/4 turn preload vs 1/2 turn preload would cause seats to fall out.

To answer your question about adjusting to the 'little' differences between the cylinders, I would suggest that this is the reason that hydraulic lifters were used by GM. Remember that VW needs a valve adjustment every few thousand miles to really keep a bug engine sharp, the forgiving qualities of a hydraulic lifter compensates for this. Understand too that I am NOT saying you can get sloppy with your valve adjustments, you must be pretty close to both the top of the firing order and the amount of preload to do a cold adjustment properly. I know this gets kicked around a lot, sorry my post is so long. Remember too that the above is my opinion, it has always worked for me and that is really all I care about. I am going to use the ways that work for me so that the cars that leave my shop are happy (customers too) for that matter.

More on Valve Adjust

I will try to answer what you are saying/asking with my opinion. First a few parameters, when I replace lifters I use SBC lifters with the disc valve, when I adjust valves, even Corvair original, I use 3/4 turn, and I adjust one cyl. at a time at TDC. My turn to ask a question; Why do you adjust valves hot and running? I think the answer may lie in the OLD DAYS when you had to adjust mechanical valves running and with a feeler gauge, I still have some of the tools. Also to let everyone know I vary quite a bit from the shop manual when it come to certain things -- see above 3/4 turn, and SBC lifters -- so to me the shop manual is a guide not the Bible. Now for some specific reasons, hydraulic lifters, wonderful things that let you take all the clearance out for quiet movement and not have to be perfect or exactly on the money for best overall performance. You can adjust SBC lifters on the Corvair from as little as 1/16th of a turn or all the way to 1 1/2 to 2 turns and the lifter will still perform the same way it was designed. You ask "why adjust cold"? Most of it has been said before but I will reiterate some and add some new, maybe.

The list:
ease of working conditions
cleanliness
open the engine up once or on a rebuild never
you don't have to destroy a part to make a shield
you won't burn yourself! (G)
the cold adjustment can be more precise
and the BIGGIE it takes less time.

I have found over the years that people are to impatient for the running method and won't or don't wait for things to settle properly. Here is an example someone puts lifters in an engine, they preadjust, run the engine for a few minutes, open up the rocker cover, make a mess with dripping hot oil, start the engine, now you have hot spraying oil all over, back the adjusting nut off until it clatters (or is that the one next to it?), then you tighten slowly until the clatter stops (but the others are making noise, are you hard of hearing?), once the clatter stops on that valve you adjust slowly, no more than a 1/4 turn until the engine smoothes out again, the clatter is still there, you adjust another 1/4 turn, this continues until you get nervous about how far down you've taken the nut, (or you don't know any different), then pretty soon, finally QUIET! BUT GUESS WHAT? You've bottomed out the lifter to make it quiet and now the lifter cannot function the way it was designed. Now you think you have the cat by the tail because the engine is running OK and pretty quiet as far as lifter noise goes. You then put rocker covers on and clean up the mess that was made by all the oil splashing everywhere. Now you drive your car and all is well. Next time you go to drive the car there is this funny little thing happening in the engine that wasn't there before and you check and check and finally do a compression test and find you have low compression on one or two cyls. And you ask why and find out that you need to adjust valves all over again! The way I adjust valves, new or used is this way; If the car is driven to you LET ENGINE COOL! Jack up one side of the car kinda high and use jack stand The pull off the corresponding valve cover Watching the valve motion of the cyl you wish to adjust bring that cyl to TDC or very close loosen the rocker arm until there is movement up and down With oily fingers on one hand pinch the pushrod and twist back and forth as you tighten the rocker down, do not hold to tight on

the pushrod once you get to the spot that with light pressure you can't twist the pushrod remove your adjusting tool and move the rocker slightly side ways to see if it was off center of the valve and now the pushrod may move easily again so go and tighten the nut some more while twisting the pushrod until it stops again, double check the rocker for being straight and if so then you are at ZERO LASH. From here you adjust the nut to 3/4 of a turn, I find it easy to do 3, 1/4 turns. Repeat this process on the adjacent valve. Now go to the next cyl find TDC and repeat the whole process on the remaining cyls.
INSTALL THE ROCKER COVER PERMANENTLY
Let the car down on that side and Jack up the other side and finish the job as stated earlier Now the kicker that everybody hates, start the engine and you will probably have some lifter noise! GO HAVE A COFFEE, SODA, OR TEA but walk away, do not jump right back in and want to adjust some more, when you come back the magic is done and if done properly the engine will be as quiet as new. The reason for adjusting one side at a time is when you jack up the one side all the oil goes to the other side and when the cover comes off there are only a few drops to take care of instead of 1/2 quart. I don't know if this answers all of your questions, but hope fully this has taken some of the mysticism out of the cold adjustment. I will add that if you try this and it works for you, you will never again adjust valves running and hot! I must also add that we all know there are bad parts out there even out of the box new.

More Valve

So far, all the negative reasons have to do with inconvenience. Can anyone offer a solid mechanical reason why cold is better? (maybe "solid" isn't the right word here ...)
I'll consider doing it cold when GM recommends doing a 1960's V-8 with hydraulics the same way. Consideration will be as far as it goes though.

Hot. Inconvenience and mess are poor excuses. Unless you are trying to do it for profit. And that is why the pros recommend cold -- not because it is better. They have done it often enough they can do an adequate job with it cold, but if you only do it once every five years, how do you get that level of experience? If you need to adjust your hydraulics more often than that, say, like they were mechanical, something else is wrong that you need to get fixed.

OEM lifters were only good for about 5000 rpm anyway, so aftermarket lifters have always been a better choice.

ADJUST THOSE LIFTERS RUNNING (third opinion)

PLEASE! Always adjust those lifters with the engine warm and running. I suggest our 1/3 valve cover. At least 2 times a week a person has an engine problem that ends up being due to incorrectly adjusted valves (hard starting, noisy lifters, burned valves, lack of power, loss of power when car gets very hot, incorrect vacuum readings, poor compression readings, bent push rods, etc.). You must set valves with the engine running!

1. Jack up car (keep as level as possible).
2. Remove muffler. Set on ground and attach with flexible steel pipe
3. Remove valve covers and replace with our 1/3 valve cover (to keep hot oil from leaking out).
4. Idle car for 10 minutes.
5. Start with a socket wrench on one rocker nut:
    A. Slowly loosen nut until lifter starts to clatter.
    B. Allow it to run this way 10-20 seconds to see that it won't pump up and

stop clattering (if it does stop clattering back it out some more until it clatters again).

C. S L O W L Y - tighten rocker nut until the clatter **JUST** stops. Wait 10-15 seconds, then

D. S L O W L Y - Turn the nut in this many turns:

Racing - 0 to 1/2 turn

Normal Driving - 1/4 to 3/4 turn

I prefer 1/2 to 3/4 as it will seldom clatter when starting engine in the morning.

DO NOT GO BY THE SHOP MANUAL!

E. Repeat Steps A through D on the rest of the rocker nuts.

6. Replace the valve cover.
7.

Cyl Head Step - possibly milled

Even without an other head to compare it to you can get a good idea as to how much the head has been milled just by looking at what is left of the gasket register step. If there is none left, then look at the spark plug boss. If the gasket register surface touches the top of the spark plug boss the heads have been milled all that they can be. A typical 140 will have a gasket register step of about .080" to .120".

I would like to hear some "IMHO" on:

Before considering any of the following it would be prudent to CC one chamber and really see what you have. Things can be deceiving, just by looking at the 'step' as the P.O. could have opened up the chamber and done other measures. Once you CC the chamber you know what your compression ratio (C/R) will be and how much material you will need to add/remove to get your C/R where you need it to be.

#1) Dished pistons

Good, but it is important only to dish the piston corresponding to the valve pocket area of the head. You do not want to increase the clearance between the piston top and the wedge of the chamber.

#2) Doing something to lower the compression by adding a "step" back into the head. And what kind of measurements can I do to determine just how much needs to be added back in.

The 'step' I believe you are referring to is the gasket register. If you want to increase this you can add head gaskets, or base gaskets. But in doing so you will decrease the engine's efficiency. If you want to weld the gasket register back in, that is possible, but plan on replacing all your valve seats also. The heat load during welding into the chamber wall, near the valve seats will loosen them up. To determine how much needs to be added back in you will need to know what the chamber volume is currently. If not, you can add gaskets and guess.

#3) Trading these heads to a "racer type" enthusiasts for some good 140 cores?

Sure, but I think you can still get these heads to work. I may add also that if the heads have a C/R that is just a bit high, let's say 3/4 to 1 point you may also want to consider a SafeGuard as an alternative measure. Keeping the close deck height is very important for a wedge chamber head like the Corvair and anything you do to increase the deck height drops engine efficiency. In this matter you may not need to dish the pistons or add head gaskets. You will have a higher C/R engine which is more efficient and a tight deck

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height, a great combination. But, before you do anything, try to determine what the CC of the chamber is so you know what you have to work with.

I'm curious to see if the P.O./builder bothered to get pushrods to compensate for the altered valvetrain geometry due to the step being milled out. Best measurement I can get is 26.15cm which is 10.295inches. Is this the correct length for a stock pushrod?

A stock pushrod is approx. 10.260" to 10.277". As already noted, the 'step' is the surface the head gasket sits on. The height of this step varies from head to head; the best bet is to mill it out so that it is flush with the raised area around the valves. This has to be the same amount for each chamber in a head. This is simple for a machinist to do, and if you start with 95 or 140 heads, you end up with a combustion chamber that is good enough to offset the increase in compression ratio, and actually needs LESS octane to resist knock. You can reduce the CR and make an even better chamber by reducing the width of the head gasket surface to the actual width of the head gasket (and cutting that dimension all the way to the roof of the combustion chamber)and by removing aluminum from the spark plug boss (there is usually more there than necessary to cover the threads). Removing metal in these two areas moves the center of the chamber closer to the spark plug, and unshrouds the valves. If you want to lower the CR even further, grind into the quench area adjacent to the intake valve- this will ensure that the last mixture to burn will be in the coolest area of the chamber. If you start with 110 heads, do all the above plus take out the 'peak' of the quench area that extends between the valves- the edge of the quench area should be straight, from the exhaust valve pocket to the intake valve pocket. A pair of 110 heads modified like this, with stock Rottenchesters, genuine CR of 9.5 : 1. does not detonate on 87 gas until the timing is advanced PAST the best power setting- and this is in a PG car, where low-rpm power requirements are greater.

I have done the "mill the step"

On my street motors for years - with great success, by the way. My latest engine ended up with a final chamber size of 50cc. That's about 9.2:1 with 30 over pistons, .030 large bore copper head gaskets and lots of grinding in the chamber. The advantage is good squish, quench, tumble" and an open flow path around the valves. Combine this with a deflash job on the fins and you're headed to a happy Corvair. I did one engine (a 110 in an FC) with a .110 mill and a final CR or 9.8 or 10. That engine was really sweet and I did get Otto shortened pushrods for that one. I measure the heads as follows: I have a clear plastic disc that fits into the head. It has a small hole (about 1/4") in the center. I use a 10cc
medical syringe (no needle) and water to fill the head. Dry the valves when finished and treat with oil. (you have to have good valves or a sealant as leaking valves will mess up your measurements. CR= initial volume divided by final volume. In my case that was: cylinder area = 447 cc (.030 over, as I recall, I'm working from old notes) gasket (.030 copper) = 4.5cc chamber 50cc, after step mill-off and chamber relief (grinding)
initial = 447cc +4.5cc+50cc or 501.5cc
final = 4.5+50 or 54.5cc
501.5 / 54.5 = 9.2 CR

Re #1

Dished pistons?? Are these even available??, plus read below re: squish.

Re #2 Something to recover lost step: You could use additional base gaskets. As I recall, the ones for 140 PG A/C (pn 3891552) are thicker. You will have to calculate how many ccs they add. For example, if they were .030, your number would be about 4.5cc per gasket (thickness of gasket x area of cylinder). I don't favor this approach though as I would rather take the opportunity to improve the head. Additional base gaskets reduce the squish effect and thus mixture tumble, leading to lean areas that pre-ignite.

I still run high compression and love it! You just have to have a "de-edged" combustion chamber, large bore gaskets, and lots of squish. All MHO, naturally

Torque for heads:

You will probably get an argument started over this, if not then I will. I stop the torque at 30#. I begin at 15# and I continually run the 15# over and over until the head stays at the 15# settings, then increase to 20# and do it all over again, increase to 25# and then to 30#, each time continually running the torque sequence. I have NEVER had heads come loose stopping at the 30# settings. Probably there will be stories of heads coming loose and I can even see the suggestion that 25-27# is good enough, it works for the German car. I agree with Steve to torque to 30#. However I start with 10# then 20# and finish with 30#. I've had studs pull as low as 33# so I never exceed 30# anymore. I also use the Finch torque pattern. I'm sure 10-20-30# is no better than 15-20-30#. Pick the one you like and go for it.

No controversy here. But I might just add my opinion. That is, that the head torque should be adjusted somewhat for the type of cylinders and overbore used. IMHO, the 1960-64 cylinders should use a slightly lower head torque than the 1965-69, because of the smaller head gasket sealing surface. Also if the cylinders are overbored, the head torque should be adjusted downward a couple of ft-lbs, depending on the amount of overbore. The greater the overbore, the less the head torque.

Engine Balancing

I found that getting the pistons to balance takes much more work. It is not unusual to have a difference of 3 to 5 grams on a set of TRW forged pistons. The pistons themselves don't have that much material that I feel comfortable in removing. I usually have to taper the insides of the pins to some degree to get that amount of weight. That takes some effort to grind those hardened pins.

The rods I balance the large ends and then the rod as a whole, removing material from the small end. This usually takes about 3 iterations to get the rods balanced to a 1/10 of a gram. That is usually far less work than the pistons. 3 to 5 grams spread used to be the norm with TRW pistons. The last two sets we did were over 9 grams out total spread. I hope this is not a starting trend. The pins are usually within 3/10s of a gram, so no problem there.

To truly balance a rod end-to-end requires a lot of time. Typically, Corvair rods can not be balanced end-to-end as received from a engine set. It is best to have a 'stack' of rod cores to work from and pick the six closest ones (weight wise) and go from there. The factory was pretty good about matching weights of opposing pairs of rods/pistons, as they felt it was necessary. The total spread between the light and heavy pair can be out by as much as 40 grams in factory stock engines.

For a V-Type engine rod big end and small end weight is important because it is bob weight. In an horizontally opposed engine there is no bob weight, so for most street applications, it is fine to match the total piston/rod weight to a gram spread.

More on Engine Balancing

Nine grams is a lot of work to remove from a piston. I would hope TRW could do better than that. I have several sets of rods and do pre-match them and that does reduce the work significantly. The rods by the way have a lot of surplus material and there is no problem with finding material to safely remove.

The pins move with the pistons so you can use them to remove weight for balancing the pistons. The forces on the outer portion of the pin are a fraction of what they are in the middle. That means you can remove a few grams easily by tapering the inside of the outer end of the pins. On my pumped engine, I tapered the pins to the center to remove 30 grams each.

Balancer marking

Before installing a rebuilt harmonic balance, I degree it to 45 degrees. If it is already on the car, you can add another mark at 20 degrees advance using a motor rotary tool. Make sure the marks a little different so you don't confuse them at a later date. That will give enough to check the total (static and centrifugal) advance (usually 36 degrees).

I believe Richard Finch's book "How to keep Your Corvair Alive" has a "reversed" template which you can use to install degrees onto a removed balancer assembly. If you want to identify true Top Dead Center (TDC) on an installed balancer, you can use the following method: You first disconnect the battery lead. Then replace the plug in cylinder #1 or #2 with a long 14mm bolt. It should go down into the cylinder just far enough to keep the piston from reaching the top. Slowly turn the engine over (either direction) BY HAND until the bolt tip stops the engine from turning. Make a mark on the balancer/pulley corresponding to the 0 degree advance point on the rear cover indicator. Now turn the engine back the opposite direction BY HAND until the piston again snugs up against the tip of the 14mm bolt (almost one full turn). Mark that point on the balancer/pulley corresponding with the 0 degree mark. Now remove the 14mm bolt and re-install your spark plug. Now back to your balancer, the center point between your two new marks is the actual TDC for that engine/pulley combination. It may or may not be where the factory mark is. Although this is easy to do on the car, it is even easier to do on the engine stand before installation of the motor. It will allow you to accurately set timing on the motor. Oh yes, If the new mark is way different than the factory mark, check to see if your balancer is performing an amoebae (dividing into two parts!)

Cam Grinds

There has been some good posts on VV regarding camshafts, grinds and profiles. I have received private posts from many people on this thread, so I thought I would post some general responses to the list. The following is a very brief overview of camshafts. There are many liberties that are taken here so this note is best read with a grain of salt.

Corvairs respond very well to head work and performance camshafts. It is helpful to think about the heads and the camshaft as a single item, 'a set', not two separate items. Leave the heads and camshaft out of the mix and most stock rebuilt and performance engines will look pretty much the same. It is the camshaft and the heads that will have the major effect of determining the operating character of your engine. This post is about camshafts, but since we are thinking along the lines of the heads and the camshaft as a single item, lets talk about heads.

Corvair cylinder heads can be broken down into two groups; small valve heads and 140 HP heads. All small valve heads, from all engines will share the same valve size,

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port configuration, valve angles, intake plenum cross section and a single carb mounting pad on each head, etc. The differences between years and applications are basically limited to valve spring diameters and chamber shapes. 140 HP heads have larger valve size, different and larger port configuration, different valve angles, larger intake plenum cross section and two carb mounting pads on each head. All turbo heads are small valve heads. As a general rule, 140s will show larger percentage gains (flow bench CFM) on the exhaust vs. The intake for the same amount of port work. This is because the 140 intake side is actually too large for most street engines. Small valve heads will show comparable gains on both the intake and the exhaust ports based on invested port work. [Note: the above are our observations based on our port and flow bench work. These findings may vary based on port work and testing of other people and their experiences.

Corvairs have unique camshaft requirements based on the head design. In the stock from, the exhaust port is fairly restrictive and the intake plenum is not a great help in making the intake side flow well. Most cam grinders have profiles developed for more common engines and their requirements. In this manner, you would not expect a camshaft profile which was developed for a 327 inch Chevy V-8 to be an ideal match for your Corvair. I am not going to list specific grinders or suppliers of camshafts, as things always change and even a camshaft with a specific grind number may have many different incarnations along it's development line. It is safe to state that if you look at the grinder's/supplier's camshaft list and a '270 Hydraulic' cam which is listed for Corvair has the same specifications as the same 270 cam for a 327 Chevy, then you can pretty safely assume that profile was not designed specifically for your Corvair.

Camshafts are advertised with certain numbers that help describe their operating characteristics. Most common are the camshaft lift and the duration. Most people are familiar with a cam description of 270, 260, etc. What does all this mean? A 260 camshaft will have an advertised duration of 260 degrees. The key word here is 'advertised' and we will discuss this latter. You will also see a number which is described as lift. Lift is a measured distance that the valve will lift off it's seat at full lift. A typical number for a 260 cam will be around .420". Another important number is overlap. Overlap is the amount of time, in degrees, that both the intake and exhaust valve are open. Overlap is important as more overlap generally causes loss of low end torque and poor fuel economy. Camshafts with higher overlap will tend develop more power in the higher RPM range. If a cam has the same advertised numbers for both the intake and exhaust valves, this is considered to be a single pattern cam. A dual pattern cam will have different advertised numbers for the intake and the exhaust valve. For example, a '260' single pattern cam will have 260 degrees of duration and .420" lift for both the intake and the exhaust valve. A dual pattern '260' cam may have 260 degrees of duration and .430" lift for the intake and 268 degrees of duration and .420" lift for the exhaust valve. Lift, duration, single and dual pattern are all important things to consider, but all of this is solely dependent on the actual shape of the camshaft lobe, commonly described as the lobe profile. It is the lobe profile that heavily determines the actual camshaft operating characteristics. You may have three cams with very similar advertised lift and duration numbers, but they will behave markedly differently as it is the lobe profile differences between the cams that make them different. Lobes can be symmetrical and asymmetrical. A symmetrical lobe will have the same shape (mathematical curve) on both sides of the lobe. An asymmetrical lobe will have a different shape (mathematical curve) on one side

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of the lobe as compared to the other side. Asymmetrical lobes can have many advantages to symmetrical lobes. For example, an asymmetrical lobe can lift the valve quickly off it's seat to help establish valve flow earlier, but on the back side of the lobe have a more moderate lobe profile to gently place the valve on it' s seat to prevent seat and valve damage. A symmetrical lobe will lift the valve off the seat, bring it to full lift and place it back on it's seat in the manner.

The advertised lift and duration of the cam are the common specifications published for the cam. A more accurate way of describing the actual working lift and duration of the cam is measured when the tappet is off the base circle by a prescribed amount. The base circle is the round part of the cam which does not move the tappet to lift the valve. The lift and duration numbers when stated in this case would be called the 'checking clearance' or the effective duration of the cam. The checking clearance is important since it not only makes a more precise way to degree the camshaft, but it gives a more accurate 'yardstick' to compare different grind profiles of specific cams. Most camshafts use a checking clearance of .050", but some use a .020" checking clearance. Others may use a different clearance or will not give any checking clearance. A checking clearance, or when the tappet has moved (risen) .050" off the base circle will tell you more about the camshaft lobe profile then the advertised lift and duration. This is because it takes time, in crankshaft degrees, to lift the valve off the valve seat to establish flow. The valve does not magically pop to full lift and then back it ' s seat, but must be gently raised off it's seat and then gently placed back down. All these gymnastics are call the 'ramp' of the lobe.

A camshaft with long ramps will take more time to raise the valve to full lift and place it back down to it's seat. In this case the camshaft will have less effective duration than a camshaft with faster ramps. Two camshafts may have similar advertised list and duration figures, but when the effective lift and duration numbers are viewed you may find a difference in effective duration between the two camshafts. The advertised lift should be the same as the effective lift since lift is the gross mechanical amount that the camshaft will lift the valve. This is a set number that is not affected by ramps or checking clearance, assuming the cam is ground correctly to it's published figures.

With the information lightly discussed in this note, you may have a better understanding of how to select a replacement camshaft for your engine. How much camshaft do you need for your engine? Well, this really comes down to how much head work has been done to your heads. Remember, we want to view the cam and heads as a set, not two separate items. The other factor is how much of the engine's stock character do you willingly agree to give up? Generally speaking, Corvairs will benefit from a dual pattern, camshaft based on our prior discussion on Corvair head design. Turbos show gains with asymmetrical lobe designs. Just keep in mind that the most important factors when installing your new cam are: 1) degree it, 2) make sure your rocker arm geometry is correct. Even the most fancy, high tech, new camshaft will not perform properly if you gloss over these two very important steps. If you are not sure of what cam to get and you have narrowed your cam selection to two grinds of the same cam grinder, pick the smaller of the two. This assumes that you will drive your car on the street. If you are in serious doubt, stick with a factory camshaft. They are very well designed and are good performers. I wonder how many people will understand and follow this recommendation? We have invested a fair amount of time slicing, dicing and understanding Corvair head and port work. With this understanding we developed camshaft profiles for our solid tappet roller cams. We have also used this understanding and developed specific camshaft profiles for flat tappet hydraulic Corvair cams

Deep dimpled lifters:

It is my personal feeling that the problems with the shallow seat lifters are a combination of the following improper valve train dynamics: 1. Weak or too stiff valve springs. 2. Pushrods which are weak in compression allowing the pushrod to flex and work out of a shallow lifter seat. 3. Improper rocker arm geometry. 4. Possible lack of oil flow to the rocker box. The deep dimple lifters allow for larger lead way on items 1 and 2 by helping keep the pushrod in the lifter seat if the above conditions exist. In my limited tests to verify oil flow to the rocker box, it is my observation that the deep dimple lifters do allow for greater oil flow to the rocker box.

Assembly lubricant:

I use and recommend a moly based Engine Assembly Lubricant. Part # Chem Stay3333 @ $ 5.95 ea. 2 3/4 oz. tube. provides protection from scoring, galling, and seizing, etc. Use on camshafts, crankshafts, engine - cam bearings, lifters, push rods, rocker arms, valve stems, etc. Engine, Standard Transmission, and Differential use. Specially formulated 12 hydroxy lithium base compound, contains molybdenum disulfide, high purity allotropic graphite, tackiness agents, thermoplastic polymers, anti rust and anti corrosive agents dispersed in a high viscosity oil. The anti seize (expensive) I insist on is Felpro C5A copper & graphite based

Removing lower shrouds:

On my 66 180 "stock" turbo setup, water injector working (g) and a no pinging setup, removing the lower shrouds dropped the temp gauge reading more than 100 degrees after 30 seconds or so of playing " turbo tunes". There is, of course a thought that it really just cooled off the gauge, but even that would indicate some useful cooling. If the gauge is telling the truth, then the cooling is substantial.

Improved remote oil cooler:

Dump the stock cooler. Get one from an RX7. It has an integral thermostat, and LOTS of area, plus low pressure drop. Adding barbs to the stocker will put it in parallel, and will more than likely REDUCE the effectiveness of the external unit, by bypassing it. I would second john's post about the Mazda oil cooler. take the oil cooler adapter and weld some an fittings to it that take at least a 5/8 id. run the oil lines over to a oil stat which can be mounted on the shelf behind the battery. Actually, Mike, if you keep the oil stat in the Mazda oil cooler intact, you won't need an external oil stat.

Casting flash:

Casting flash in the cooling fins can be a real problem on any Vair head, but 140s and Turbos are more critical. I've seen some really clean ones and some that are really blocked. So bad in fact that you would never believe there should be an opening in the first place. It some times takes drilling, beating, sawing, or whatever to clean out the excess aluminum. Look at pictures, compare with other heads, what ever. Its worth the time to get all the air flow through the heads that you can. Next time you deflash a head, Try a 1/8 drill 6 inches long. The same effort should be put into detailing the block. The investment of a dremel type tool will aid the deflashing and smoothing out of the inside of the block to help the oil return to the pan. Also you should align and open up a little

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the oil return holes at the bottom of the cam area, and make sure the main bearing oil galleries line up so the bearings get sufficient oil flow. I've been told by several racers that you don't need to widen the main oil galleries like suggested in the book "How to hot rod Corvair engines". The Corvair oil pump will deliver plenty of flow and pressure with the stiffer spring and a shim.

Comment 2. I use the long 1/8" drill mentioned by others, since it has the capability to remove metal fast and help "machine" away metal from misaligned fins on each side of the heads, which will open the pathways much more than just removing flash. You need to be careful to not remove too much otherwise you could trash a head. I follow up with the round hacksaw blade mounted in vice grip pliers. With one end of the mounting hardware removed, it is stiff enough to use like a file (carefully), but it works better and faster at removing metal. All this work can be done while the heads are in the car, but having them out is certainly easier. I haven't tried using a Dremel tool with the round hacksaw blade, but that is next. Good idea. I take about an hour on each head to remove the flash and open up the misaligned fin areas. Don't under estimate the improvement in cooling by providing about 2 to 4 times(!) the amount of air passage area, possibly more.

Comment 3 I've used round masonry hacksaw blades on a dremel after the 1/8 drill. Need about 4 for 2 heads. Cheap N' Fast

Comment 4 Whoever had the Brilliant idea of using a round hacksaw blade was right on the money... Only difference being that I had to use a cordless drill instead of a Dremel. Still, worked GREAT!!! I think I'm actually finished! My only recommendation is to break the blade in half -it's still long enough, and far less flexible.

Head Deflashing:

Like all cast objects, Corvair cylinder heads (the silver fins--the rusty fins are the cylinders) are cast in molds. The molds used were made from a hard cementaceous material, and had several different parts that were stacked together and held in a clamp. The molten aluminum was then forced into the space between the different parts of the mold. After everything cooled off, the molds were removed, leaving a bare cylinder head casting. The exterior of the head was cast with a two-part mold with a single seam. If the seam wasn't perfectly tight, the molten aluminum got into the gap just the same as it went anywhere else there was an opening available. This typically produces a thin piece of material called "casting flash." GM didn't spend all the time they might have removing the flash from the cylinder heads, which is bad because it blocks airflow over the fins, and makes the engine run hotter than it was designed to. Somebody with a flashlight, some time, patience, and the right tools can open the fins up in the head much more than the factory managed. We call this deflashing, and it's a good thing. It's easiest on a cylinder head sitting on the bench. But it's not bad when done on an engine with the upper and lower shrouds removed, and can be done quite successfully with the engine in the car (kinda rough on the back, though).

Head deflashing tool:

1) Go out and buy a good hacksaw blade (chromium-vanadium steel). These are springier and less brittle than the cheap ones. Then take it to the bench grinder and make a deflashing tool out of it. Mine is modeled on Fisher's in How to Hotrod Corvair Engines and looks like this:

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The thickness of the thin part is about 1/2 the original thickness. The tooth on the end (about 1/4" across, square edged, and as wide as the blade) is used to grab the flashing and rip it out. You'll want to wrap some duct tape around the handle end to protect your hands. If you grind the notch and tooth on the back side of the blade, the saw teeth can be
used to enlarge a hole if the tooth can't get a grip on the obstruction. Be careful not to overheat the blade when grinding it, or you'll temper away the hardness of the metal, and it'll be useless. Dip it in water frequently, and stop grinding when the water begins to boil off the surface. If the metal discolors then throw it in the trash and start over.

Another useful tool is made from a bicycle spoke. Grind the threaded part to a sharp point, cut off the curved bit at the other end, grind that to a point, and then bend the last 1/4" 90 degrees, making a skinny mechanic's scribe. This can be used to poke a hole through flashing big enough to get the sawblade tool into, if a hole is completely closed off (common problem in between intake and exhaust ports).

2)I've had good success with two different things. The cheapest is a piece of flat bar stock from the local hardware store. I can't remember the exact thickness (measure the spacing on the fins), but it was probably 1/8" thick. I hacksawed it into sort of a long triangular shape and used it with a hammer to break out the flashing. If you want to be a little more "sophisticated" then go to the hardware store and look for a long, thin chisel. I think the tool shown in the shop manual is just a chisel ground flat.

3) The best 'tool' I have used is a 1/8" or 7/23" aircraft extension bit mounted in a 3/8" drill motor. These bits are 6 to 12 inches long and the correct 'size' to move between the fins. Use them as a 'rotary file' and a pair or three will do a set of heads in about a 1/2 hour time.

4) One of the most comfortable (as in preserving skin) flashing removal tools I have used is made by the Milwaukee Tool Co. Milwaukee makes a nicely designed hand grip handle for manual sawing which accepts all of their Sawzall blades. (This and a plaster cutting blade make a great tool for drywall work) I have modified a few "Bimetal Super Sawzall" blades into designs similar to those described by others. Since the bimetal blades only have hardened teeth, they can withstand a lot of bending and abuse. The handle costs about $15 and blades are kind of pricy, but hey, good tools are always worth the money in my experience.

Corvair Studs:

In answer to Yenko 66 's questions about studs; Get the piloted block main bearing stud kit and reamers from Clark's as they had them made and paid for the tooling. They are really only needed on all out[225HP+] race engines, however. The stock , unrusted , block to head studs have held 14:1 compression on my SCCA GT3 engines since the early 1980's. To fix a slightly loose stud problem, a oversize one from Clark's will usually work, sometimes needing locktite. To fix a real loose or pulled stud I have found that a Timesert [tm] works best. Kits for various sizes are available from Clark's or Timesert directly. One caveat: The threads on the block end of the stud will have to be shortened and reformed to a std [vs interference] thread to fit the insert once it is installed so it can engage the full length of the insert. I just finished doing this on a 3.1 liter block that

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needed all 12 of the top studs replaced and it took about 8 hours[@ $35/hr]. The beauty of the Time sert is it's thin shell, thus allowing the block to be opened up for the 94mm cylinders without running out of aluminum. They also work great in sparkplug holes, and once swaged into place make a perfect gas seal and won't come out with the sparkplug like the KD ones do. Great for engines that need the plugs checked all the time. Bob [Dr Corvairkian] Coffin

More on inserts: My weapon of choice is a Timesert, available from www.timesert.com. These are MUCH better in my opinion, since they take out a little more of the stressed aluminum in the hole and have a positive locking feature where the inside end is fatter, so when installed it flares outward locking the insert in place. I JB Weld these in as added insurance. You must chase the threads on the head studs since an interference fit will destroy the insert. I have painful memories of this happening once to me. You will also chew up dies chasing the threads on the head studs, but this is not very expensive. I have never had one fail and they form a steel threaded surface for the head stud. While the tool and inserts are more expensive than Helicoils, what is a $2 insert versus removing a head to replace a pulled insert?

More on stud removal:

First I use double grade 8 nuts and see if I can twist it out, being VERY careful to not twist the stud into a pigtail. Once that is done, you really DO need to remove the stud. If it doesn't move then I step up to using the Sears stud puller, which doesn't do as great a job as I would like. I try a LITTLE harder at the base of the stud. Other people have used a torch to heat the stud, but that heat tempers the stud and renders it useless and you are then forced to remove it. Save the torch for those instances where the stud is damaged and absolutely needs to come out. I take a thick walled pipe of the correct length and two very thick washers sandwiched between the block and the head stud nut. I then torque down on the head stud nut to about 35 or 40 ft-lb. If it holds with that force and doesn't start pulling out, which simulates the typical head torque then it was meant to stay in the block and should not fail in service. Thus, you don't need to remove it. You could do this test first, if you like. I do all this because I have had head studs pull out even with the Larry Claypool recommended stud installation torque in the CORSA Tech Guide. I have had MANY studs pull out at 20, 25, 30 and 35 ft-lb. A real short-word language enhancer! After the stud pulls out along with the aluminum block threads, I use a TimeSert, from TimeSert Company or www.timesert.com, of course. I have only had one TimeSert fail, when I was first doing this and did not know to chase the interference threads on the stud prior to installing the stud. VERY BIG mistake! I use overkill and JB Weld on the outside of the TimeSert, because I want this steel insert to NEVER come out. I also use high temp Loctite to keep the stud in place and to not move during installation and head nut removal the next time. It is OK if it moves when removing the stud years later, but the Loctite will help prevent that from happening. Fortunately, with the TimeSert, replacing a stud that TWISTS out is not a big deal.

More: I need to replace a couple engine block studs and need to know what loctite product would work the best. ans: Use blue Locktite. It holds the studs and more importantly it seals the threads against oil leaks. IMHO

High volume oil pump :

I'll just note that Blake Swafford is the only person I know of who actually measured oil pressure at the conrod bearings in a Corvair engine under different conditions. He found that pressure at the bearings was low enough with a hot engine at speeds around 2000 rpm that it was troubling to him. Given that the car was designed to spend a lot of time in that range, I'd say that his concern was justified. Since he was looking at competition modifying the engine, and there was a real possibility of sucking air into the oil pump pickup in hard cornering, he adopted the time-honored procedure of bumping up the oil pressure. If you're not anticipating hard cornering, then there's no reason to shim the spring. Boosting the volume improves the amount of lubrication available is something that I have found to be a good idea all the time, given how low oil pressure drops when the engine is hot with the stock pump. As for potential harm from elevated pressures, since the engine has a design oil pressure of 30 psi, it's not too big a deal to go to 50 psi--no moving seals are pressurized, and the flow rate past bearings should be about the same. The advantage the higher pressure has is that a bubble of air is much smaller at 50 psi than at 30 or 10. And bubbles don't have much lubricate. The most useful change for a non-sporty Corvair is to get the high volume oil pump simply because the lifters pump up faster with one, if nothing else. **More**: I have never had a problem using a HV oil pump, but there are some caveats: Let's not confuse HV (high volume) with High Pressure. We want volume, not high pressure. 40 - 60 psi is the pressure range we are looking for. More is not better. Buy a quality kit. The OTTO Parts kit is the only one I would use or recommend. The other kits do not locate the gears solid in the housing and will cause accelerated wear and side loading of the gears on the housing. Expect to spend, at least, 2 hours to install the kit. This is if you are starting with a clean housing, off the car. Add whatever other time needed to remove and clean the housing. I have seen too many 'butcher' jobs with all the kits. Please take your time and you must follow ALL directions in the kit, not just SOME of them. This includes detailing the pump gears and the bypass. Gear end clearance must be properly set. Do not think, close is good enough. Get it right on. Make sure everything feels and looks perfect BEFORE you install it on the engine. Now is a good time to blueprint or 'prep' your oiling system. The stock dist. gear roll pins are prone to problems. There were two sizes used; a large one and a small one. I usually drill the small ones out to the 'large' size. I use a carbide bit for this. This is probably not necessary in all cases. In any case you should replace the stock roll pin, they are usually worn. Use a hardened, spiral roll pin. It is prudent to bond the gear to the shaft. Dale Manufacturing does this to all their dist.. The stock pump is adequate at 4,500 rpm, but it is marginal around 2,000 rpm.

Oil leaks

Absolutely reasonable to have an oil-dry engine. I did a 140 that's still hanging in the back of my Spyder that I rebuilt back in 1975. I know..., but I had it around and the original 150 was really in bad shape... Someday I'll finish the 150... The 140 has just started leaking last year (very minor) around one of the push-rod tubes. I'm impressed - 20 years! In any event, I've done several no-leak 'vairs and the basic rules are:

1) Clean everything (esp sealing areas) and then clean it again
2) Use GM seals/gaskets (except for vitons)
3) Ensure all the surfaces are flat! (oil pan, valve covers esp)
4) Use Silicone Seal as a gasket sealer, light coat on each side of each gasket
5) Be careful installing the o-rings to not cut them
6) Torque every bolt correctly
7) Immediately fix any leaks that you find at start-up

IMHO, there is no reason for oil leaks anymore with Vitons and proper maintenance. Plus, you can now use the heater!

Useing studs on Valve covers :

I recommend you do not drill the extra two holes. Use only the four already there. I have used studs for mounting valve covers on many of my cars for years. It absolutely guarantees no leaks, and looks trick as well. They will work with either stock or cast covers. I cut sections of 1/4-20 threaded rod to length. (depth plus about 3/4", varies with thickness of cover and gasket.) Using a double nut, screw them snugly into the heads. Loosen and back off the nuts. I use 1" tall 1/4-20 hex nuts which I have cross drilled near the tips. After gluing the cleaned gasket to the cover, I set them down on a hard surface overnight with the gasket face down. (Watch out with stock covers the cover may hit the hard surface before the gasket.) I grease the face of the covers then slide them over the studs down onto the head. With stock covers, always use the holddown clamps. Tighten the nuts until a finger nail will just fit under the clamp at the holddown nut. The clamp will deform and spread the clamping force along the cover. When finished, I safety wire each vertical pair of nuts together over the cover. It may seem like a lot of work but it's not, and the cost is about $5 for all the parts. And NO Leaks. - Seth

Shot peening rods :

Shot peening is a process of setting up compressive stresses in the metal to improve the fatigue strength. Fatigue strength is the failure caused by a cyclic number of loads. Fatigue can cause early failures in stressed members like connecting rods. By shooting the rods on the outside surfaces with round steel shot there is a concave dimple formed like a controlled dent. This dent imparts some residual stress in the compressive stage in the rod.

3 angle valve job :

Main purpose of a three-angle valve grind is to restore the proper valve-to-seat seal. Normal valve seat width would be approximately 3/32nds of an inch for a Corvair. As valve seat wears, it's 'sealing area' gets spread out from the pounding action of valve. If proper seat width isn't restored, overheating of valve could occur. Usually, a grinding stone of 30 degrees is used first to re-establish seat height. Next, a 60 degree stone is used to determine seat width. Finally, a 45 degree stone is used for proper valve-to-seat sealing and to gain exact seat width. The use of coarse and fine grade stones is also a factor for a good finish. After refinishing valve seats, it's normal practice to lap valves in to eliminate any minute imperfections that may inhibit proper sealing of valves.

Starting an engine for the first time after sitting for years:

1. Jack front of car, cut rubber line in middle, drain all fuel(or whatever) from tank. Plug tank cut line piece (clamp), add 1 gal acetone to tank. Cap tank. Let sit at least four days. Disconnect fuel pump inlet steel line. Blow through with compressed air, then soak in acetone as tank is doing. Be sure to plug pump end of line or acetone will evaporate. Drain acetone from tank and line, blow line out with air. Connect tank, line, engine with new rubber hoses (even if the engine end hose wasn't bad before, acetone isn't good for it). Trust me on the fuel system stuff. It's lots easier to clean tank and line than repetitively do carbs. If you're not planning on driving the car, and just want to run the engine, get a 1/4" pipe-barb connector, attach to fuel pump inlet, and feed the engine from a tank and hose behind the battery or somewhere. Don't feed the carbs from those 19-year static lines.

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2. Remove the distributor and all six spark plugs. Put the heaviest engine oil that will pour at the available temp range down the plug holes (about 50 mL/cyl). Drain crankcase and refill with cheap, but not brand X oil in a 10/40 or 20/50 grade (coking restrictions don't apply--you won't be using this oil for even 500 miles). Change filter. Let oily cyls sit for at least a day before attempting to turn the engine. Get/make pump priming bar (bar stock with flat ground on one end is my fave, long spoon bits and discarded distributor shafts have also been used). Hook to your strongest drill-motor, set to clockwise, and give a good rip. When the drill slows down, you've primed the pump. Let it run another 30 sec like this (use a watch-it seems like an eternity). Then try to turn the engine over with a wrench on the crank pulley. If successful, turn engine slowly with wrench while running oil pump--this will fill each rod bearing as the galleries line up. Go through two full crank revs like this. If your drill is strong, you'll get 20-30 psi, which is enough to pump the lifters and pushrods up, which will also save you some grief. If the wrench wouldn't turn the engine, try a little more leverage(but don't try to break the crank bolt--it will). If this didn't work, a fresh battery and the starter are worth a try. If the starter won't budge it, you're down to kerosene, marvel mystery oil, and your favorite deity. If the starter *does* budge it, stop as soon as it moves, and turn it by hand--can break rings on rusty bores otherwise. Engine turns? Hand-turned and primed through two revs? OK. Next step:

3. Hook fuel pump up to fuel source. Take off the air cleaners and cross-pipe. Jack up back end of car so that rear wheels are clear of ground. Use jackstands, because you're going to run it like this. Check diff and trans oils (don't skip this one--trust me!). Put it in neutral, install a fully charged battery, and give it one last drill motor priming before you reinstall the distributor (don't hook up yet--don't want any ignition just yet). Check everything visually, and then get somebody to turn the key while you watch the engine. Spin the engine over on the starter motor for 30 sec (use watch again--it's even longer when you're holding the key to "start"). You're watching for gasoline to flood out of a carb... The oil light hopefully went out quickly during this. With no plugs in the engine, the starter motor just slung oil all over the engine from the crank throws, which is what we want. It also blew oil out all six plug holes, so clean up the mess and install the plugs. You probably already primed the fuel pump with the starter, but check it for prime now. Of course, if you have a stuck or sunk float, you found out about pump prime from this...

4. Hook up the ignition and fuel systems. Check belt tension. Start the engine. IF the carbs primed, and you set the timing right, it'll almost certainly catch. If it doesn't seem to want to, check for oil fouled plugs, though this is rare after 30 sec of no-plug cranking. If it catches, only let it run for about five seconds, then cut it off, put it in first or low, and restart. This allows you to pump lubricant to all the transmission parts quickly, and coat the diff gears all under no load. A fast idle should be enough to throw some oil to the pinion bearings, but I usually change to fourth or high to make sure it works (this is about equal to 20 mph wheel speed). Fourth(3rd if no 4th) in the manual trans also locks the shafts on the trans, which removes any load from the cluster gear, ensuring it sees oil before load.

5. Let it run with the rear wheels whizzing over for at least fifteen minutes. Make sure the chokes and thermostat doors open normally, but don't take it off the fast-idle cams--it needs to sling oil around inside everything. It'll smoke you out of the garage--beware. When it's hot, put it in neutral, synch the carbs, set the timing, etc. Put the engine back

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together.
5a. For manual trans, the clutch is almost certainly rusted together. The quick way to *try* to pop it loose is to put it in fourth, start the engine (drive wheels spinning again), and when the engine is warm and torquey, tromp the clutch to the floor (you checked for adjustment first, didn't you?), goose the throttle and yank up on the handbrake.

Either a) the engine will die,
b) the clutch will pop loose, or
c), you will find the handbrake doesn't work.

If c), manually set the fast-idle cams on the engine to get it spinning fast, then push the clutch to the floor and tromp the brake pedal. A) or b) will occur. If a), a more aggressive second effort may succeed. If it doesn't you get to pull the engine and do the clutch. If b), or your automatic works right, Grin, drink beverage of choice, take it off the jacks and go for a short drive (short only till you check out steering and flush the brakes). BTW, if you had an auto trans, these will sometimes suck up a quart of fluid to fill the converter. Be sure to check fluid level before actually moving the car with the engine for the first time, and watch it carefully for the first ten minutes driving or so for level changes.

Oil pump clearance :

The thinner the gasket the more output the pump has until there is binding. Then you can snap a distributor shaft or a gear shaft. I put the pump together lightly oiled with a .007 gasket and see if it turns. If it doesn't try a .011 and so on till it turns. Put some .002 to .006 Plastigage on the plate under both gears and tightener-up. On disassembly you will know the exact clearance. The shop manual list the desired clearance as .002 to .005. I would shoot for .002. Gaskets are available in about .003 increments. Don't forget to prelub the engine before you start it. If you do prelub it, it isn't necessary to pack the oil pump (imho).

Removing rusted cylinder head nuts

Getting the old rusted nut off the crankcase stud is the biggest challenge. Start with a 6 point (only!) 9/16 as Steve recommended. If that starts to slip, use a metric 6 point socket (13mm, I think) as it is slightly smaller. Seat the socket onto the rusted nut firmly (read that hammer), then give it a shot with the air impact. If the nut is really bad and slips with the MM socket, you may have to try again with a 1/2 socket. Be sure to really beat the socket on (sears counterman-"what happened to this socket?" gee, I dunno, it just got that way) as you only have a few shots at this, and be sure to push hard on the impact wrench (towards the nut) to try to keep the socket on the nut . The threads on the stud will be OK under the nut; even though the outer threads are shot, this won't pose a problem if you are reassembling the engine using the same heads and stock thickness gaskets. If you plan to lower compression through thicker gaskets however, the rusty studs will be a problem.

If a crankcase stud unscrews with the nut , this is not an immediate problem. Clamp up the stud in a vise, you can then remove the nut off the end while on the bench. What you really must be careful of is re-installing the stud back into the crankcase. The spec is 10 to 30 foot LBS of torque to screw the stud in. If the stud takes much less than 10 FT LBS to go in, you should install the next size stud to get the installation torque up to value. Studs are available in standard, .003, and .006. I have found new standard studs to do the job in most cases, but this is a select fit process. Also, every other stud hole goes directly into the open crankcase, you must be careful the inside of studs installed in these locations DO NOT thread in further than flush with the inside of the crankcase - big time interference with the con rod bolt from the opposing cylinder! Crankcase studs are kind of tricky, do not disturb them unless you really have to.

The reason for the torque spec (GM's, not mine) when installing studs is so the stud threads get a GOOD grip into the crankcase. While the loctite would prevent a stud from unscrewing, I don't think it would add any strength as far as the pull out value. Unscrewing of the stud is not really a problem anyway. If you put in a stud that took less than 10 foot pounds to install, you risk the possibility the threads will pull out of the block when you torque up the head nuts. yes, fracturing of the aluminum crank case is the problem. Most engines I find that are in need of crank case thread repair were due to someone's previous work of reinstalling an old crank case stud with no regard to the installation torque value.

Pulled studs

Be VERY careful with pulled studs. Think and look very closely at all studs and the Al. surface (stud boss in block). If a stud pulled it is usually because of heat or abuse; likewise the others have been subjected to the same. You do not want to put that 'new' engine together and pull another stud because it was tired. Helicoils for head studs MUST be ~ 1 inch long. You will not find this size at most places. Most places sell the ~ 1/2 inch long insert. You need the length for the stress of the head stud. You can use two 1/2 inch long inserts and 'make' a long one. It is a pain... I use the Time-Serts full metal threaded inserts. The are much stronger.

I have little respect for helicoils in this application. I finally decided to make my own repair inserts; 1/2 - 13 O.D., with an inside diameter at 3/8 - 16; overall length at 1", same as the original stud threads. You do have to run a die over the stud threads to get down to a standard 3/8 - 16, so they will go into the insert. These have worked great for me, never had one fail yet! Larry Claypool

Pilot bushing removal

Instead of messy greasy etc and homemade tools, simply put a tap 5/8" or so into the bushing and screw it into the crank. When it bottoms out, the bushing will be pulled out by the turning action. No mess. I have a couple of different styles of pilot bushing pullers and they don't work as well as the tap method.

Gasket sealers:

I know of three basic kinds of silicone gasket sealer/maker. Ya got your blue stuff, your yellow stuff and your orange/red stuff. The blue stuff is the old standby. It comes in two flavors which we might think of as smooth and crunchy. Smooth is what most of us scrape off of engines built more than about 10 years ago. It's a pretty good gasket sealer, but makes a lousy gasket by itself because it has such a low viscosity before curing. The crunchy type has a higher viscosity, and also has little bits of aluminum in it to make it more thermally similar to metal in its expansion properties. The orange or red stuff is usually sold as a higher-temperature version of the blue stuff. I have successfully used it as a threadlock on exhaust pipe clamps. It did eventually burn away when used on a muffler because the exhaust was just too hot, but any distance away from direct exhaust it seems to cope pretty well. This is also available in a crunchy version, which has little bits of copper in it. I use the copper as a head-gasket sealer in some applications (not needed on a Vair). The yellow (tannish, actually) sort is usually specifically for cars that have oxygen sensors in the exhaust plumbing that can be hurt by the metal content of the

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RTV compounds used in some other sealers. Obviously not an issue for most Corvairs.

I haven't seen anything that said one sealer was especially bad for aluminum. I can think of two ways that this might be the case. Either 1) sealers with entrained copper have enough copper in them that you get galvanic corrosion, which would only be a problem with a gasket exposed to water, or extremely high temperatures, or 2) the acetic acid emitted by (AFAIK) all RTV silicone rubbers when curing is retained and corrodes aluminum. Both of these sound like pretty marginal problems for a Corvair, because we don't have any water running around inside the engine...

I have successfully used the crunchy blue flavor as a replacement for valve cover gaskets on a Vair engine (with steel rocker covers). It was so successful that I am going to use it as the next oil pan gasket I do. As for the rocker covers, I like gaskets glued to the cover but unglued on the other side so that I can get in there without tearing anything. I will also note that I haven't seen a real gasket on an engine out of a car plant in years...

Pilot Bearing

Pilot bushing baking instructions...

Pop the little sucker into a toaster oven and heat it up, the drop it into a can of used engine oil. It will suck up oil like a shop rag in no time

Oil Coolers :

The three worthwhile stock oil coolers for the Corvair are the folded fin, 8-plate and 12-plate. Of these, the folded fin is the most efficient, and removes something like 10% more heat from the oil than a 12 plate. The 8 plate isn't even close.

The folded-fin is the first cooler design, and was used on all 1960-1962 Corvairs (I'm not sure what year used them last, but I know that they're gone by 1964). The only disadvantage the cooler has is that the spaces in the fins are so small that they're easily plugged, so cleanliness counts. I remove the cleanout cover and spray mine with brake cleaner from the bottom side (through the damper door) about once a year to remove debris and oil film (which impedes heat flow and attracts more debris).

The plate design coolers were supposedly cheaper to make and were also more crud resistant. By no coincidence, the 8-plate cooler has the same dimensions as the folded fin, so it works with the same shrouding. Unfortunately, it's much less efficient, which is why GM bothered to make special shrouding and 12 plate coolers for the high heat load engines (A/C cars, 140s, 180s). I don't know if the late FC engines came with 8 or 12 plate coolers, but I can say from experience that *MY* FC benefits from the folded fin cooler. In any case, a 140 or 180 would benefit from a folded-fin just the same way my van does. Having said that, I run the 12 plates with side shields on both of my 140s because a) it looks stock, and b) my problem with the cars is usually an over-cooled engine, not an over-heated one. If I build a turbo for one of my Corsas, I'll probably put dual folded-fin coolers on it...

Rod specs:

The specs are in the book. The key measurement on rod journals is ovality. They're more prone to wear at TDC and BDC than any other time. So you measure the center of the journal in the axis of the crank throw, then 90 degrees off axis. If the two numbers are the same you're in grand shape. If they're more than about .0015" different, it's crank grinding time. If they're round, you then need to check that they're in spec. for an available set of rod bearings. If they're worn too far under, it's grinding time again. And

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yes, one being out of spec means the whole crank has to be done. It also means you probably need to have a close and careful look at the main journals, cam, and cam bearing surfaces in the crankcase.

Thoughts on head rebuilding:

let the machine shop advise you as to what needs to be done, especially whether the crank needs to be turned. As for the head work, Larry brings up a good point , in that the gasket land should be trued up, however I really question the wholesale replacement of valve seats. If a seat is found to be loose (and its usually an intake on a 140), its a sign of overheating and all seats should be CHECKED, but again, a good machine shop should be able to make this inspection and whether seats should be replaced. Ditto on the valves and springs. I've yet to see a valve suddenly fail (unlike VW's) on a Corvair (I'm sure someone will have another opinion), if the valves are good, there's no real reason they can't be reused in a street motor. Same for springs.

As for the cam and lifters, probably not a bad idea. I'll reuse a cam that looks and measures out OK, but I'll always use new lifters. There's a general rule of thumb that you shouldn't mix new and used cams or lifters in the same motor, but I've put new lifters on a perfectly good used cam with no problems. Oh yes, make generous use of assembly lube!

Generally rods don't give any trouble on a Corvair, but the machine shop can check them for straightness, if you wish. Balancing of the lower end is also probably a waste of money in your case. Back to the heads, as to replacing the guides, again let the machine shop make the call. Slightly worn guides can be knurled, but I've found that's not long lived; replacement is a better investment.

Reply Larry Shapiro:

I wouldn’t replace the valves unless you need to...most of the heads I get in maybe only need 1 valve replaced.. save your money.. make sure the seats are BIGGER ONES, not just replacement ones....mine will NEVER come out... seals should be teflon and not the cheap rubber kind that last 25k miles I just read someone’s response that said "why replace valve seats if they are good??" well,90 % of all heads that come into my shop have bad seats…its OK with me if my customers don’t replace them, cause I’ll see the same heads over and over each time another seat falls out.. the $348 that I charge to replace all seats with ones that will not come out is much better than replacing 3 pistons, cylinders, rings, and sometimes the head when one falls out and ruins everything...I see this all the time..one last opinion on valve seats!! Some say don’t replace unless bad, others say seats mostly fall out after a fresh valve job...here are my findings after 21 years building over 1000 engines and repairing thousands more...

1. only once have I seen a seat fall out after a valve job!!
2. once a seat falls out, then fixed...good chance others in same head will do the same!

I didn’t see surface heads on your list.. this is another important thing, as most shops do not do this the correct way..3 different areas need to be done, not 1 or 2 as most shops do

Head work & seat repair

I will repeat: I have never seen an untouched, UN-overheated Corvair head of any type drop a seat (have a 155,000 mile pair on my '65 right now). Therefore, machine shop work and/or overheating are the culprits. This doesn't mean that you can or should avoid machine work on the heads, but it does definitely mean that you should be careful, and

think ahead a little further than GM did when they designed and manufactured them.
1. Never have a machine shop reface the intake seats on 140 heads. You are more careful and more accurate with grinding paste at home anyway. It is theoretically possible that the seats could be refaced with a power grinder if small cuts were taken and the seats not allowed to get hot enough to work the metal around them. I'm not sure I would trust anybody in a time-is-money environment to take this approach. I will further note that most of the time all you need is a little circularizing of all the seats anyway--they're very hard alloy, and don't wear much in use. For these purposes two sizes of grinding paste and some time are better than all the world's power grinders.
2. If the valve guides are worn (as they usually are) and you decide to replace instead of sleeving or whatever, then go to bronze guides. Remove the iron guides by heating the head in the oven to about 300 F, oiling and driving out with a centering punch. This will prevent galling of the guide bores in the head. The new guides should be cold--at least dry ice cold, and the heads should be at least 150 F (preferably about 200 F) when you press/drive them in. Dip the guides in assembly lube before you freeze them. This will prevent a) galling of the guide bores in the heads, and b) upsetting of the head metal during installation. Bronze guides are recommended because the thermal coefficient of expansion of bronze is much closer to that of aluminum than the stock iron material is--this makes it less likely that the guides will wander in the heads after installation.
I should've mentioned this, especially since I do it myself. Will cc this to the group. Might also be a good idea to mention the semi-obvious: Always drive the guides out from the rocker side to the cylinder side, because this side is cleaner, so debris is less likely to score the guide bore.
3. Don't run exhaust valvestem seals. This will keep the exhaust guides from wearing. Exhaust valvestem seals don't do anything but prevent a little puff of blue smoke on startup. Intake seals, unfortunately, are necessary if you're to avoid carboned-up intake valves. but I do not use intake valve seal with SiAl-Bronze guides. I could be operating under the old school. I know the Teflon seals are very good, but it was my understanding that seals would possibly prevent some of the necessary lubrication of the guides. I am open for more current info. on this matter. **Reply** I've seen multiple takes on this. The bronze guides (Silicon-Aluminum Bronze, as you note) that we use should seal better to the valvestem than the iron guides did. Further, if you're careful to get the stem-guide clearance down to a small value, it should stay that way if you run roller-tipped rockers of some sort. This should reduce the oil pulled past the valvestem to a quantity that will be washed away by gasoline in normal operation. As long as you're running carburetors your only penalty to a little carbon on the head of the valve is some flow restriction, but if you go to PFI, then it gets to be a worry, because the carbon tends to soak up small shots of gasoline (low rpm) like a sponge, causing awful driveability. Ideally, what I'd like to do is run the engine without any sort of stem seals for a while, then, after everything is well seated and the oil requirement is reduced, install seals. It might be a worthwhile exercise to drill an itty-bitty hole in the guide to act as an oil feed
No idea how good or bad this would be.
4. Use roller-tip or full-roller rockers (see the archives c. six months ago). These basically eliminate shear loading on the valvestem and dramatically reduce valve guide wear, especially when using stronger than stock valvesprings. This means you won't have to do guides again for quite a while. If your 140 heads have been previously

machined (as most have), look into one of the positive seat retention systems out there. Threaded and pinned seats are the most positive installation, because they cause the seat to
be retained with some sort of mechanical interference. A good thermal press-fit should last well if done right.

More on head work

Deck height is how much below the top (deck) of the cylinder block the piston is at TDC. The deck height is meaningful on a normal engine because the head surface bolts up in contact with the block. The distance between the piston and the head is what we really are concerned with. Deck height doesn't really exist on Corvairs since we don't have a cylinder block. Our equivalent is the distance between the piston and the flat surface of the combustion chamber when everything is torqued down. *The optimal distance is 0, a more realistic distance is 0.035", enough to accommodate some rod stretch and a bit of carbon.* When milling a Corvair head the gasket-register surface is cut down, usually flush with the flat area of the combustion chamber. The fins must be milled to allow the cylinders to seat with the head gaskets. Using extra-thickness gaskets or stacking gaskets is just the opposite of milling the heads. By stacking up head and base gaskets I can imagine some Corvairs with over 0.125" of clearance, just the recipe for pinging.

Milling the heads gives a more desirable combustion chamber shape for quicker burn of the fuel. The quicker it burns, the less chance it has to malcombust and detonate. The greater turbulence provided by the tighter squish area also helps combustion. Milling also increases the compression ratio. It is necessary to readjust the compression down via milling of the piston top (only the area not adjacent to the step in the head) to get the ratio down to something the engine will be happy with on common premium fuel, ESPECIALLY with A/C.

All this milling work, as has been pointed out by Ray and others, is a costly and time consuming process (all has to be CC'd and the pistons rebalanced): the end results, when done carefully and completely, are impressive. But you may not want to take the time or money to get there, that's up to you. Stacking the gaskets is a quick and effective way to lower the compression. If you go that route, I prefer to use more base gasket than head gasket, as the base gaskets are not subject to the heat and pressure their counterparts are; less chance of trouble. of course you can only do this with fresh cylinder/piston/rings, before they develop a wear pattern in the cylinders.

Reducing deck height does increase C/R. The Corvair head is inefficient and
is very prone to ping because of excessive deck height. By reducing the deck height, you increase the efficiency of the head and reduce it's tendency to ping. Milling the heads does increase the C/R; but it is the shape the combustion chamber takes after milling that helps to control ping. You have apparently not followed this thread from the start, as the theory has been explained already. the other part of the job is to mill part of the piston tops to reduce the compression back to a liveable number for pump gas. BTW, it won't work on your particular car. Milling the heads to tighten the squish area only works on wedge type heads. smog 110 / 95 heads are open chambered. thus no wedge. Larry C.

95 HP heads :

The power is not wasted, these heads combined the correct cam profile can result in a much cooler running, high low-end torque motor that will provide many years of useful

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service. The fact is, GM didn't increase the cooling capacity of the large valve heads, in fact they reduced it. Hold up a 140hp head and look between the intake and exhaust valves, especially in the seat area (clean the flashing out first). Then hold up a small valve head and you will notice there is much more room for air to flow between the seats. The power is not wasted, in fact the 95hp motor as GM designed it actually produces higher torque below 2300 rpm than the 110hp or 140hp. It peaks out at "95hp" at an rpm substantially lower than the 110hp or 140hp. Higher compression of a gas in and of itself without any ignition produces heat. I agree that quench area is important and the Corsa tech guide has a very good discussion on this. You can have a low compression engine and still have a good quench area. Why have a lower compression engine? Less heat. More safety margin from pinging. Less force placed on bearings, pistons, valve train, crankshaft. All this results in a longer service life. The article in the Corsa tech guide however takes the approach that having an optimized quench area means that you can and should run higher compression. Talk about living on the edge!!

It would be interesting to put two Greenbriers back to back in a tug-of-war, both equally prepared, only difference being that one has a 140hp motor in it and the other has a 95hp motor in it. Optimize the quench area on each, give the 140hp 9.2:1 compression and the 95hp 8.25:1 compression. Wonder which one would win?

By the way, the 95hp heads are not "open chamber heads" like the smog heads. They are more like the 80hp heads and I know what to do with the 140hp heads, they are staying in a lightweight car where they belong.

More on detonation

The best way to combat temperature and pressure induced ignition is to keep the mixture cool (stable) at points far from the spark plug. Localized hot spots should be removed by careful cleanup and polishing, and by reducing the squish area by milling out the step. CC'ing the heads is strongly recommended too. Unshroud the valves and round off any sharp areas. Cleanup the exhaust ports so that less heat is transferred into the cylinder heads and religiously cleanout the flashing from the heads. (If it doesn't take you several hours a head to do all this, you're not doing a complete job.) Make sure your mixture is not running to lean and an unrestrictive exhaust is helpful too. This route will take more time than a quick decompression job but the results are well worth every effort. And remember, your engine can only run as strong as the most ping prone cylinder allows it to.

Engine rebuild

Pistons. Yes, replace. Old ones have a nasty habit of cracking around the oil ring. Cast will be just fine. Make sure you don't order them 'til you determine if a rebore is needed. As to reboring, a rough guide is if you have a ridge over .010 thick, then you should rebore, but no more than the next size piston that will true the bore. Deep scores, or scores that can't be removed with honing need to be rebored. Don't bore unless you have to; it raises the compression. Years ago that would have been good, but not with today’s gas. Crank gear, it should be fine, leave it alone. The cam gear is another story. this is something that has been argued back and forth. If the gear looks good and shows no trauma, I'll reuse it. Rockers and push rods. Again these are fairly bullet-proof; check push rods for eggy ends and rockers for irregular wear. Replace as necessary.

More on engine rebuild

You want reasonable street performance but in a very "stock" mode--in other words, you want to use the car for pretty much what it was built to do...

yes > Full engine gasket set

yes > Head nuts

yes > New lifters

maybe > New camshaft

Corvairs aren't especially hard on cams. I have seen quite a few stock GM cams that are on their third hundred thousand. Probably the optimum cam for your purpose would be the mildest dual-pattern Otto grind. Second to that would be the stock 304 cam with the powerglide 4 degree timing adjustment. If the engine has this, and it looks good, you'd be hard pressed to justify the extra money for another cam.

no > New Cam gear

as long as the crankcase cam bores are round (check this), the cam gear shouldn't have seen any strange loads in its life. All it turns is the camshaft, since the oil pump etc. are driven off the crank. These just about never fail in stock engines--

yes > Rebuilt harmonic balancer

yes > Rebuilt distributor (recurved for new gas ???)

yes > Rod bearings

yes > Main bearings

yes > Motor mount (mines is shot)

yes > Trans mounts (mines are shot)

yes > Get heads worked on

maybe > Get crank ground

Measure ovality. Grind if necessary. Never voluntarily remove metal from a crank if it doesn't need it. Be sure to have it magnafluxed in any case--Corvair cranks do crack.

no > New crank gear

you don't have a clutch. There is no source of shock loading on the crank drive stub. The crank gear itself is steel, and meshes with an aluminum gear. It is nearly indestructable in your application.

yes > New Pistons (what size, Cast or Forged??)

size to match the required jug overbore. Bore no further than required to make the cylinders cylindrical again--you wouldn't feel the few extra cubic inches made by an overbore. Cast pistons should suit your powerglide fine.

yes > New rings (steel, chrome, or moly??)

chrome are supposed to last longest, but take forever to seat. Moly seat fast--no idea on wear. Steel is a good all-round ring. I use steel or iron as first choice. Be sure that the surface finish of the bored cylinders matches what the rings require.

yes > Bored Cylinders (bored out to what size??)

see above. Just enough to make them no longer tapered or oval.

maybe > New blower bearing

maybe > New idler pulley bearing

These actually have a very long service life. They fail on Corvairs because the grease is 30 years old, not because the bearing has reached its fatigue lifespan. Check for roughness. Get a greaser tool for each, clean thoroughly, grease, and reinstall. Both are easily replaced if (for some reason) they do fail.

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These are things that I am not sure of:

yes > Can I reuse the old connecting rods, I plan to get them balanced?
Balancing will make your engine smoother. Make sure that you have them trued--many GM rods were made with twists or bends to them. And have the big ends honed so that they'll be round. This extends rod bearing life.

maybe > Should I replace the valves?
In your application don't replace unless they fail the GM wear tests or are obviously defective.

yes > Should I replace the valve springs?
400 degree cylinder heads are not kind to spring alloys.

maybe > Should I have all seats replaces with oversized ones? $$$ This is a problem. 140s are more prone to dropping intake valve seats than any other Vair. I have observed that the ones that drop seats have either a) been overheated, or b) have had the seats ground with a power tool. Undisturbed stock heads on a happy engine seldom drop seats. If the engine has successfully gone 90,000 miles, I'd be inclined to leave the valve seats alone as much as possible. I expect that this will generate some discussion...You will need to replace the valve guides, however. Replace them, and then hand-lap the seats and valves to a good seal. Should you decide to do the seats, I prefer the high pressure pressings or screw-ins. Never have stock 140 intake seats ground.

yes > How is that fail-safe cam gear, overkill?

depends > Are reconditioned rods worth the money?
getting rods that have been gone over is a good idea. You can buy them exchange or have them done by a local shop. I prefer the latter if I know of a good local shop.

no > Should I install new rocker arm kits if old ones are okay?

no > Should I put in new pushrods if the old ones are okay?

More on rebuild

I would like to offer the following observation and comment on heads and pistons for the high output Corvair engine. Do them right the first time, as if either one lets go, you can kiss all that hard earned money and hard work goodbye. A dropped seat will tear up one side at least, plus the turbo, and possibly the other as well. A broken piston at high speed can cause the whole engine to come un-glued.... Either way, not a pretty sight. Put a lot of effort in making things solid, and check clearances, tolerances, etc. many times over carefully.

I would recommend that you spend the extra $$$ and get a good *Corvair* specialist to do the head work for you. Have them go over them with a fine tooth comb as far as the condition of the seats, and guides go. If in doubt, change it. It is far easier to change all of the seats, etc. now than when one goes on you. One person that has done excellent work for me is Bill Devecka in Bend, Oregon. He knows what he is doing. He did my head work, and cylinder work. I had my rods trued, and the large end re-sized. Again, not too expensive and well worth it.

Split crankcase :

Use the bearing shells that you are going to rebuild the engine with, this is the clearance you want to check, not with your old bearings. You need to place the plastigauge on the crankshaft bearing journal. Place it such that it is along the axis of the crankshaft. Many things will affect the accuracy of the plastigauge. You must:

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Have spotlessly clean surfaces.

Torque the case using the factory procedure and torque.

Not move the crankshaft during 'plastigauge'ing'.

[Note, the following stuff is esoteric in nature. You may never come across any of this stuff, so do not worry. The below is more, or less, for general information as to how a premium engine is built and the time/effort necessary to do it.]

Look for a good, even squish of the plastigauge. If it appears thicker on one end or the other, this may be an indication that the journal is tapered. Compare the plastigauge readings with the recommended factory clearances. Note, that not all journals require the same clearances - verify this with the shop manual. If everything looks good, wait you are not done yet!

Clean everything up again, oil the main bearings and install the crankshaft in the case, no camshaft now. Torque, to specs, using the factory sequence. Now rotate the crankshaft a few revolutions, both clockwise and anticlockwise. You should feel no binding, just a smooth even 'feel'. If you want the technical stuff, I shoot for 15 lbs/ft [+6, -2] of torque to keep the crankshaft in motion. As they say "your results may vary", this is just what I have seen as typical during assembly of blue printed engines.

Now if you feel any binding, you need to find out where it is coming from. Do this by loosening one pair of case nuts at a time. I am referring to a 'pair' of case nuts as ones that pass through the same bearing saddle. Pick a pair, and spin the crankshaft again. If it makes no difference, torque that pair back up and pick another. When you find the offending pair(s), this is where you need to 'fix' the problem. The fix depends on a few
things, each engine [and owner] are different, so I will not go in to the details now.

Also, what is the groups opinion about sealing between the crankcase halves?

Use no sealer, generally. Unlike a V.W./Porsche most of the Vair case parting lines are covered by other gasketed surfaces. If you desire to use a sealer because your cases are 'beat up' in one place that you think will be a leaker, then you may use a VERY THIN application of engine shellac type material. Ray Sedman

More thoughts on clearances:

Yes, you need to do the plastigauge thing. No, you don't use the old shells--you don't care what the clearance between the used shells and the polished crank is, because you're not going to use the old shells anyway. Put the new shells into the case dry. Take the plastigauge strip out of the sleeve (hang onto the sleeve). Cut off a little of the plastigauge (1/4" is plenty). Put the piece of plastigauge in the bearing shell. Repeat for each of the other main bearings. I suggest you do the cam bearings the same way. Then put in the crank and cam, put on the other half of the case, and bolt together in the manual-specified way. Take everything back apart. Compare the thickness of the plastigauge pieces (which has now been smooshed by the small bearing to journal clearance) with the scale on the sleeve. (I just think Plastiguage is a cop-out to doing it right and false economy given the minor cost to get it all properly mic'd. Plastiguage being 'less than ideal' as compared to measuring clearances with micrometers.)

Hopefully the number you get agrees with the number you want. It's also a good idea to check the crank for ovality (should've been polished out, but you never

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know). The best way to do this is with an outside micrometer of the appropriate range. The bearing bores in the case can be snap-gauged for roundness as well if the case is bolted together empty. Don't forget to do rods the same way--they're more commonly a source of trouble than mains are on these engines. *Rad Davis*

Performance rebuild :

Ain't gonna get Salih jugs at a usable price. If all you want is 250 hp, this should be easily managed with just boost, exhaust, and cam mods, after you build a strong bottom end. IF you insist on more displacement, there's a way to adapt type 4 vw jugs and pistons to the Corvair, which can get you up to 190 ci or so. First things first: Build a strong bottom end. Lightened, balanced, shot-peened rods, a prepped crank, forged pistons are necessary. High vol. oil pump. Etc. etc. Might be a good idea to go to the extra-stout case cross-bolting system. Oversize bolts on the flywheel. Welded crank gear. As for head work, temps will be high. You'll need redone intake valveseats (pinned, screwed, or deep-pressed). Stainless valves. And, for the flow you need, an angle port exhaust job and headers. Cam? Probably choose something in the Otto TB-xx range, depending on rpm you anticipate. How much boost were you planning on? You'll need some compression reduction, & a vacuum advance/pressure retard unit for the distributor.

Rebuild for Supercharged car :

First, Compression must be lowered for street driving. Try 8:1 and 8lbs. boost or 7.5:1 and 12lbs. of boost. 140 heads work great with the angle port mods, and tri-port manifolds. Don't just rely on boost to make power, free up some power and increase efficiency by porting the intake and exhaust. The more boost you run, the more heat produced by the s-charger. Horsepower is not a linear increase with boost because of the extra heat produced! You will definitely need angleport and headers on the exhaust. Make sure you also have an ignition system that can handle the added "boost" in power. You will need a cam with a pretty radical exhaust lobe, and a slightly milder intake lobe. I would recommend either shotpeened and polished/ resized / 11/32" bolts in stock rods (street), or aftermarket 4340 rods (race).

Example rebuild:

Engine: 140 - .60 over TRW (about 170"), heads milled as in the tech guide, that is the step is milled out of the chamber. Chambers liberally opened up around the valves. Ports cleaned up. "High pressure" valve seats by Bob Coffin when he was in Mass (I think he used to be in Mass, probably done by Ken Black.) Stock 140 exhaust. Stock base gaskets. Thin (.032) copper head gaskets for minimum head to piston clearance and maximum squish. Everything balanced very closely. Heads cc'd to a real 9.00-1. ALL, repeat, ALL the flash removed from the heads. Isky 280 cam with Rhoads lifters. Shortened Otto push rods. Dale distributor with a liberal advance curve which I did myself on a distributor machine. MSD 6AL spark box and coil. Carter Knock Eliminator. Folded fin oil cooler and Mazda oil cooler mounted in the plenum before the A/C condensor. LOWER SHROUDS REMOVED IN WARM WEATHER! Have I left anything out? Sure, Clarks pan, polished gasket surfaces per Fred Johnson's book, big crank bolts, set screwed cam gear etc. The idea here is that the oil cooler and the removed shrouds keep everything COOL. Oil, NEVER gets over about 230, usually cooler. The MSD provides plenty of spark. The Knock Eliminator keeps knock under control - it controls the generous spark advance when it's hot out and the oil gets hot. About the only time there's any knock to

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control is during part throttle moving away from a stop when the vacuum advance sucks it in too much. When using more throttle and RPM there's no knock.

Cc'ing the heads and milling the pistons - here's how to do it. First mill the heads and fins. Second do any opening-up of the chambers and porting. Then have the valves ground, lapped etc. so they're ready to go. Assemble the short block and measure the distance that the piston is above or below the top of the cylinder. Don't use base gaskets - add .013 for a stock compressed base gasket. When cc'ing your heads be sure your valves seal, take several readings.

These are the dimensions I had, at least I think these were the final numbers:

A. = My combustion chambers = 46.0 cc

B. = Cylinder volume (.060 remember) = 454.931 cc

C. = Head gasket volume (.032 gasket compressed to .029) = 4.668 cc

D. = Piston below cylinder top volume = 1.239 cc

E. = Volume milled from the piston = 4.992 cc

Compression ratio = A + B + C + D + E / A + C + D + E

(Anyone disagree with this formula? Look at this very closely before you answer. This formula leaves the amount milled from the piston as part of the cylinder volume. Is this right? Of course it also ignores the little hole where the piston is turned, but in the end these are constants.) How do you get the Vol milled from the piston? (Boy I did this a long time ago, let's see...)

Use the equation:

Desired CR (9.00 in my case) = A + B + C + D + E / A + C + E where E is the only unknown. Notes: squish area must be .030 -.050 to work, mine was .034 - .037.

The area of the piston you're milling is 7.0787 sq. in

How much to mill from the pistons:

desired vol. to mill / 116.09 = the amount to mill

Here's something I'm pretty sure of:

How to mill the pistons

(If the piston is represented by a circle of piston diameter) Measure 1.00" up from the bottom of the piston (towards the center of the circle). Strike a line intersecting this point which is angled at four degrees, higher on the right, lower on the left. Mill everything above this line. Be very careful! Be sure that when the piston is in the engine the milled portion is above, that is towards the top of the engine. Be sure the four degree line lines up with the corresponding line on the head. I think I milled .045 from my pistons.

My car is a very tractable, pleasant car to drive. You might think that having the oil cooler in front of the A/C condensor (all air is drawn through first the oil cooler, then the A/C condensor) would super-heat the air for poor performance of both the engine and the A/C and high oil temps. Not so. I can cruise down the Interstate at 70 for a few miles (it takes about 20-25 miles) until temps (oil and cylinder head) saturate then turn the A/C on. Temps do not rise at all!

Head gasket orientation :

I always put the flat side to the head, seems to me the "round ' side will flatten out (or slide) easier against the cast iron barrels. *Larry Claypool*

To all: At the risk of starting yet another controversy, I have always placed the flat side against the SOFT aluminum and the curved side against the HARD cast iron cylinder. My theory has been that the curved side would dig into the soft aluminum. Not saying

my theory is correct, just the way I have always done it. In the beginning, the copper head
gaskets were not shaped like that, they were flat on both sides. Probably in one of the bulletins mailed to the dealers there was a note on how to place them but I never saw one during those years. *Steve Goodman*

Replacing exhaust tubes:

You are supposed to heat the head and pack the tube in dry ice before Assembly. At this point, you may have plowed up a ridge of aluminum that is blocking the end of the tube from seating in the bottom of the hole.

Cam Gear:

You probably have a stock engine. If so, the cam bearing areas on the case are probably worn oval. If so, this allows the aluminum gear to rock side-to-side, which causes enough gear misalignment that the steel gear chews up the aluminum one. Sooner or later, the steel gear will turn, and the aluminum one won't. The case can be align-bored by a good machine shop. This will true up both the cam and crank bores. Use a snap gauge to measure cam bore ovality. Also check the cam journals for roundness and proper diameter. Marginal cam bearing lubrication would aggravate this condition. Be sure to check the crank bearings for signs of scoring (these are fed from the same oil gallery), and consider installing a high volume oil pump kit in any case.
Other possible causes:Badly stuck valve gear. Usually this bends pushrods, but it is possible that the cam gear would give way first. Heavy duty valve springs. These can produce elevated cam journal and gear loads.

Adjusting valve lifters :

I've been using regular small block Chevy (283 - 350, etc) lifters for as long as I've been playing with Ultra Vans and they work just fine. The secret is to get the lifter in the middle of it's adjustment range. I set the lifters a bit differently using a vacuum gauge. To do the initial set, . You should either: 1) read the shop manual and adjust the appropriate valve at TDC for cylinder #1 then for cylinder #2 (360 degrees later) or 2) go through the firing order turning the motor as you go 1/3 at a time through two rotations. I agree with rolling the pushrod in your fingers to determine zero lash. After doing this on all cylinders, I crank each rocker nut down 1/4 turn (your lash may vary), put the covers on and go in to wash up. The next day all the lifters will have bled down to the correct settings and the valves will have closed.

Initially setting up your valves on the bench works just fine and the turning pushrod approach is as accurate as it gets with the following additions:

1. Make sure that the pushrod has seated in the lifter cup and is not hung up on the side. This can and does happen quite easily.
2. Rock your rocker assembly a bit to make sure that it is fully seated or your "just lashed" pushrod will become loose again one things start moving.
3. Set the crank at TDC and work through all of the valves. Then turn the engine one full turn and do the valves that have gone loose on you. You should have exactly six of them.
4. Turn the engine over a few times and check that none of your adjustments suddenly go loose, indicating that there was an oopsey somewhere along the way.
5. Turn down the valves an additional 1/4 to 1/2 turn.

After the initial set and the engine is running for a warm-up period, I drop a vacuum gauge down under so I can read it while adjusting the rockers. For years we

have seen diagrams how a vacuum gauge can be used to tell you when you have valve trouble, so here is a way to use the gauge to set the lash. I watch the flicker of the needle and turn the rocker-ball nut down until the gauge flickers more violently, at this point you know the valve is not closing, then back it off the other way until it flickers at the other end
of the adjustment. This gives me the exact range of adjustment. I then set it in the middle. As you go through the adjustment, the needle of the gauge becomes more steady as more valves are set correctly. Since this method takes a little longer, the half-cut rocker covers are a must to keep from loosing too much oil. I've seen it written somewhere
that a trick to slow the oil flow for initial adjustment is to put some grease in the push-rod oil hole and it blocks the flow until the grease melts. Apparently, it gives you a couple of minutes. Has anyone tried it?

Helicoil and antiseize (sparkplug)

Helicoil type inserts are permanent, they don't come out when you remove a sparkplug and they'll take more abuse than the original aluminum threads.
Though the Solar Cavalier late Corvairs were alleged to use helicoil inserts on ALL six plug holes, most people don't do this unless they have to: If it works, don't fix it.
Antiseize is very cheap insurance on the spark plug threads, on *any* engine with an aluminum head. Heat conduction from plug to head may be changed when using
an insert (stainless steel isn't as thermally conductive as bare aluminum) and/or by using antiseize, but the inserts and antiseize layer are thin and there is _another_ heat path available (see last bullet below).

The insert does slightly alter the electrical conductivity from the spark plug threads -to- head path required for a good ground path, but there is another path available. See below. The spark plug cylinder base flange always makes contact with the head either directly, or via a washer. so both electrical continuity and heat conduction are maintained
even with an insert, or antiseize, or both. *<u>Use aluminum or copper based antiseize</u>*

More on helicoil :

Also, somebody mentioned before routinely installing inserts into every head worked on. While I wouldn't hesitate to do it on shot or "questionable" holes, I have qualms about making it standard procedure. Here's why: Heat transfer from the plug to the head is much poorer when an insert is used over than with an unaltered head. Part of this is because you now have 2 inserts where you had one before, and part is b/c of the switch from aluminum to SS, which conducts heat much less readily. Also, Never-seize
is supposed to be quite an effective insulator as well. >>

This makes for a good argument for "**TimeSerts**" as they are copper and follow the threads and compressed in (not too bad for heat transfer/conductivity). They also rarely (I've never had or heard of) back out. I'll also comment that never seize is not a good idea as it creates a good insulator both electrically and heat wise. This will cause poor firing reliability and early heat failure.

Milling the heads:

Milling the heads gives a more desirable combustion chamber shape for quicker burn of the fuel. The quicker it burns, the less chance it has to malcombust and detonate. The

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greater turbulence provided by the tighter squish area also helps combustion. Milling also increases the compression ratio. It is necessary to readjust the compression down via milling of the piston top (only the area not adjacent to the step in the head) to get the ratio down to something the engine will be happy with on common premium fuel, ESPECIALLY with A/C. All this milling work, as has been pointed out by Ray and others, is a costly and time consuming process (all has to be CC'd and the pistons rebalanced): the end results, when done carefully and completely, are impressive. But you may not want to take the time or money to get there, that’s up to you. Stacking the gaskets is a quick and effective way to lower the compression. If you go that route, I prefer to use more base gasket than head gasket, as the base gaskets are not subject to the heat and pressure their counterparts are; less chance of trouble. of course you can only do this with fresh cylinder/piston/rings , before they develop a wear pattern in the cylinders. Whichever route you go, I suggest you not put it together as it sits at the moment; the compassion is too high/ chamber too inefficient for satisfactory operation on an A/c car

MORE:

When I built my engine about ten years ago I researched and studied how I wanted to do it for about a year. I have been very happy with the results. Here's what I did: Car: '67 coupe w/factory A/C, condensor in front of the plenum, not over the engine. 4-speed w/3:55. 24.88" tires, 225/50-16 rear tires. Engine: 140 - .60 over TRW (about 170"), heads milled as in the tech guide, that is the step is milled out of the chamber. Chambers liberally opened up around the valves. Ports cleaned up. "High pressure" valve seats by BobCoffin when he was in Mass (I think he used to be in Mass, probably done by Ken Black.) Stock 140 exhaust. Stock base gaskets. Thin (.032) copper headgaskets for minimum head to piston clearance and maximum squish. Everything balanced very closely. Heads cc'd to a real 9.00-1. ALL, repeat, ALL the flash removed from the heads. Isky 280 cam with Rhoads lifters. Shortened Otto push rods. Dale distributor with a liberal advance curve which I did myself on a distributor machine. MSD 6AL spark box and coil. Carter Knock Eliminator. Folded fin oil cooler and Mazda oil cooler mounted in the plenum before the A/C condensor. Otto adjustable pulley used during cool weather and for autoX. STOCK PULLY USED WITH THE AIR CONDITIONING! (Do not try to use the Otto pulley with the AC.) LOWER SHROUDS REMOVED IN WARMWEATHER! Have I left anything out? Sure, Clarks pan, polished gasket surfaces per Fred Johnson's book, big crank bolts, set screwed cam gear etc. The idea here is that the oil cooler and the removed shrouds keep everything COOL. Oil, NEVER gets over about 230, usually cooler. The MSD provides plenty of spark. The Knock Eliminator keeps knock under control -it controls the generous spark advance when it's hot out and the oil gets hot. About the only time there's any knock to control is during part throttle moving away from a stop when the vacuum advance sucks it in too much. When using more throttle and RPM there's no knock. Once in a while when driving at moderate speeds - say 35-45 mph - in hot weather with the A/C on it gets a little warm - just shove it up into third to bring the revs up a little and it cools right down. Cc'ing the heads and milling the pistons - here's how to do it. First mill the heads and fins. Second do any opening-up of the chambers and porting. Then have the valves ground, lapped etc. so they're ready to go. Assemble the short block and measure the distance that the piston is above or below the top of the cylinder. Don't use base gaskets - add .013 for a stock compressed base gasket. When cc'ing your heads be sure your valves seal, take several

readings.
<u>These are the dimensions I had, at least I think these were the final numbers</u>: A. = My combustion chambers = 46.0 ccB. = Cylinder volume (.060 remember) = 454.931 ccC. = Head gasket volume (.032 gasket compressed to .029) = 4.668 ccD. = Piston below cylinder top volume = 1.239 ccE. = Volume milled from the piston = 4.992 ccCompression ratio = A + B + C + D + E / A + C + D + E (Anyone disagree with this formula? Look at this very closely before you answer. This formula leaves the amount milled from the piston as part of the cylinder volume. Is this right? Of course it also ignores the little hole where the piston is turned, but in the end these are constants.)How do you get the Vol. milled from the piston? (Boy I did this a long time ago, let's see...)**Use the equation:** *Desired CR (9.00 in my case) = A + B + C + D + E / A + C + E where E is the only unknown. Notes: squish area must be .030 -.050 to work, mine was .034 - .037. The area of the piston you're milling is 7.0787 sq. inHow much to mill from the pistons: desired vol. to mill / 116.09 = the amount to mill Here's something I'm pretty sure of: How to mill the pistons*(If the piston is represented by a circle of piston diameter) Measure 1.00"up from the bottom of the piston (towards the center of the circle). Strike a line intersecting this point which is angled at four degrees, higher on the right, lower on the left. Mill everything above this line. Be very careful! Be sure that when the piston is in the engine the milled portion is above, that is towards the top of the engine. Be sure the four degree line lines up with the corresponding line on the head. *I think I milled .045 from my pistons.* My car is a very tractable, pleasant car to drive. It is not high-strung. I do very well in economy runs and autoXs. Having A/C in a car like this is great! You might think that having the oil cooler in front of the A/C condensor(all air is drawn through first the oil cooler, then the A/C condensor)would super-heat the air for poor performance of both the engine and the A/C and high oil temps. Not so. I can cruise down the Interstate at 70 for a few miles (it takes about 20-25 miles) until temps (oil and cylinder head) saturate then turn the A/C on. Temps do not rise at all!

Seat replacement:

Valve seat failure is cause by getting the valve seats really hot - either through outright over heating (driving with the belt off) or through pinging. Either transmits much heat from the valves to the valve seats, causing the seats to expand and thus lessening their press fit into the head. If you do that often enough (or hot enough once) the seat will fall out. The only way to be reasonably certain a seat will not fall out is to recondition the head to include new valve seats (properly installed) and then operate the engine in such a manner as to prevent pinging or outright stupidity (belt off).

The problem with a used head is that you really do not know the history of it. I mean, if it was so good, how come it is just a head sitting there instead of a whole motor running. Old heads can generally be repaired but always replace all valve seats, not just the one that fell out. The whole head got hot, thus every valve seat is in danger of falling out just as the one or many did. Also the heat of welding during repairs would tend to loosen other undisturbed seats in the head. Probably the determining factor in whether a head should be repaired is how much welding is going to be necessary to put the combustion chamber(s) back in to shape. If only one seat area needs welding it is probably a good candidate. If the loose seat broke and sent pieces through all three combustion chambers, a lot of welding and subsequent machining will be needed to bring that head back. In that case, you might want to consider an undamaged or less damaged head as a starting point. Larry Claypool

Cylinder heads:

I hope you are aware that the "step" in Corvair parlance is the circular ring of raised aluminum that the gasket seats on. That big flat surface opposite the valve pocket is called a squish area normally. Cutting this out will *not* improve combustion. It will, however, make your heads into smog heads...I also hope you realize that cutting out the step without enlarging the valve pocket in some way will raise compression. This can cause problems if you aren't careful. Either the chamber can be enlarged (around the spark plug is the best place) or the piston can be undercut under the valve pocket (only doable with forged pistons). Try to aim for a static compression ratio around 8.5:1 or less if you intend to run normal 93-94 octane high-test. The big restriction on a Corvair engine is the exhaust side. If, with this intake plumbing, you run headers and free flow mufflers and otherwise leave the exhaust system alone, you will probably want a medium street
grind--something like the OT-20 Otto cam.

RE: top cover leak

This trimmed baffle "solution" has always given me the willies. Great potential for that guy to resonate, fracture, and kami-kaze the engine. I've felt this not to be the leakage problem its been made out to be. Sure, if you don't reinstall it right (failure to remove ALL old gasket material) it'll leak, but as Gary says, proper use of RTV should make it leakproof. I will agree with this. I have opened up engines that were in use for years and had multiple oil leaks. Some of the top cover bolts had even worked their way to being pretty loose. The top covers have never shown evidence of leaking enough to amount to anything. On the other hand, that differing expansion rate that people seem concerned about is still happening. Instead of working the gasket a little, that expansion is now working on the homemade brackets or added screws that are required to hold the modified baffle in place. I say leave well enough alone & work on a real problem instead. Plenty of engines have been assembled the 'factory style' w/o leaks. If you must do this First, DO NOT use gasket sealer between the top cover and the baffle. Second, use 'shake proof' bolts on the top cover. These will hold torque and will not loosen. If you want to cut the baffle, it is quite easy. First, mark the 'top' side and 'front to back' orientation. Once you cut the baffle, you will loose most of your clues as to how/which way the baffle sits on the engine. The idea is to cut the outside perimeter of the baffle such that it fits in the top cover. Drill and tap the top cover at four corners to attach the baffle.

Gasket dressing compound:

As for gasket-dressings, I just put most of an engine together using a THIN coating of Hylomar by Permatex/Loctite (Pep Boys carries it). I spent a while researching what to use, and after talking to Loctite's Application Hotline, decided that Hylomar was the best compromise based on the operating temps, mostly aluminum parts, my desire to use gaskets, and my willingness to reduce gaps (i.e. imperfections) between surfaces to what the Hylomar specs dictate. If you want any more info on this subject let me know - I have a pile of literature at home. Hopefully this stuff will work - I prepped the surfaces as described above, but I haven't run the engine yet :(so I don't know how well the

Hylomar really works I have used Hylomar (from Rolls Royce) exclusively on a few engines, so far. I have been very happy with the results. I would recommend it for any Corvair gasket need. It is also available in a aerosol can; works great for the rear accessory housing, oil pump, oil cooler adapter gaskets.

Engine rebuild

The piston notches face the flywheel. All rod "numbers" should face up. While all rods are symmetrical, pistons aren't. Compression? If you're not terribly picky, anything over 110 psi is good, ideally all cylinders should be within 15% of each other. .

Heads are just about the most important part of the engine, breathing is everything. I also forgot to mention cleaning up the inside of the ports, especially the intake side, I find a lot of casting junk left from original that needs to be cleaned out. I believe that you should get a reputable machine shop to do the heads or send them to Larry or someone. The assemble of the lower end is pretty elementary and by following the book should not give you any trouble Regarding reground cams, The reground cams are not "a few 0.001" different. Depending on the total lift of the reground cam this WILL be a significant deviation to upset proper valve train geometry. I recommend that all cams be checked for proper valve train geometry. It is an important step. I must also note that the current rocker arms supplied by Clark's are not acceptable for reground cams or billet (new) cams with high lift. I do not know if other Corvair vendors are supplying the same rocker arm, but I assume they are. You may want to consider 'remanufactured' Corvair rockers supplied by Larry's Corvair. The new rocker arms supplied will cause accelerated valve tip / valve guide wear because the toe of the rocker is ill-formed as compared to the acceptable stock rocker. If you are running a new cam (not reground) and your heads have not been milled more that 0.020",and/or you are not running extra thick cylinder base gaskets/head gaskets you probably do not need to check your valve train geometry.

Retorqueing Rocker studs after pushrod seal replacement

Having done more than my share of pushrod tube seal jobs over the years, I can offer the following feedback: I always remove all of the rocker studs at once, starting from the outside and working my way in. When I retorque, I work from the center out, in increments of 10 foot pounds, starting at 20 ft. lbs. That is I do all studs at 20, then all at 30 .... I then check the torque on the top studs, going from the center out to make sue none are loose.

Pulled studs

The book calls for antiseize, and from a little experience, I found they are right, though others may disagree. I don't think thread lock compounds do a good job of lubricating steel into aluminum threads. The only problems I've experienced are 1) the stud pulling from the block while torquing a head nut -- this was a failure of the aluminum thread in the block. It needed an insert to fix that. 2) The stud unscrewing because the head nut and stud were badly rusted (use oversize stud .003 or .006). My feeling is that if the nuts/studs are badly rusted and don't come loose easily, then it's time to use a nut cracker and cut them off rather than risk unscrewing a stud. One tip is to install acorn nuts over the ends of the upper studs after you've rebuilt the engine. They will help keep the end

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from rusting.

HI Vol. oil pump & shimming pressure release spring

Well, if you promise to be gentle with your 180, you'll be OK. But remember that the turbos are the only Corvair engines that have another oil leak that the pump wasn't designed for: the turbo. It also needs a reliable supply of cooling and lubricating oil, or you scram the bearing and/or get coking. For any turbo that was actually going to get worked hard, I'd definitely suggest the big pump, if not a spring shimming.

As for shimming the spring, it's a relatively straightforward process. You just put a washer behind the pressure-regulating spring in the oil pump housing. Thicker washer = more pressure. I think the "How to Hotrod" book mentions it.

More from Larry C. Shimming the spring refers to placing a portion of a bolt or other object about the same diameter as the oil pressure regulator spring between the spring and the end cover bolt. This will give the spring greater tension thus requiring more oil pressure to move it. The stock spring in good condition is set to start relieving pressure above 35 psi. I do not know of a specific formula that shows x length of shim will increase pressure by y number of pounds. Unless somebody else in the group can give a specific length, I think it will be left to trial and error to get the pressure you want. I would caution you to not get carried away; 50 psi is plenty. Naturally you'll need an oil pressure gauge to verify the changes you've made. If the engine is really just a stock motor, that is in good shape, and you'll simply be using it for ordinary driving, there is probably no need to have more than the stock psi.

More from Ray Sedman Numerous comments on HV oil pumps..... I have never had a problem using a HV oil pump, but there are some caveats: Let's not confuse HV (high volume) with High Pressure. We want volume, not high pressure. 40 - 60 psi is the pressure range we are looking for. More is not better. Buy a quality kit. The OTTO Parts kit is the only one I would use/recommend. The other kits do not locate the gears solid in the housing and will cause accelerated wear and side loading of the gears on the housing.

Expect to spend, at least, 2 hours to install the kit. This is if you are starting with a clean housing, off the car. Add whatever other time needed to remove and clean the housing. I have seen too many 'butcher' jobs with all the kits. Please take your time and you must follow ALL directions in the kit, not just SOME of them. This includes detailing the pump gears and the bypass. Gear end clearance must be properly set. Do not think, close is good enough. Get it right on. Make sure everything feels and looks perfect BEFORE you install it on the engine. Now is a good time to blueprint or 'prep' your oiling system.

The stock dist. gear roll pins are prone to problems. There were two sizes used; a large one and a small one. I usually drill the small ones out to the 'large' size. I use a carbide bit for this. This is probably not necessary in all cases. In any case you should replace the stock roll pin, they are usually worn. Use a hardened, spiral roll pin. It is prudent to bond the gear to the shaft. Dale Manufacturing does this to all their dist. If you are using your Vair in road racing, you probably do not need a HV oil pump. The stock pump is adequate at 4,500 rpm, but it is marginal around 2,000 rpm.

Lower shroud removal:

For most of us, taking the shrouds off is a big mistake. What used to be a quick warm up now takes forever, with detrimental effects on the engine far worse than the benefits of cutting the peak oil temp. Ever remove the oil fill cap on a car with shot thermostats?

The inside of the cap looks like mayo. All that crap is water, fuel, and combustion byproducts that were never cooked out of the oil because the oil never got hot. Can you spell "C-O-R-R-O-S-I-V-E"? Here's some questions that you may wish to consider in deciding what to do with the shrouds:

1. Do you do a lot of short trips? (a "Yes" suggests leaving them on)
2. What's the peak oil temp now? (time for a gauge) in spirited summer driving?
3. What's the peak cylinder head temp in spirited summer driving?
4. Do you have a ping problem (might be improved by dropping head temp)?
5. Do you mostly drive in Phoenix or does the car spend time in colder zones
6. With the shrouds off, does the oil still always get up to 180F or so? Over 212F is necessary to boil off the water, so that is better. Oil is kinda like porridge, it should be neither too hot nor too cold, but "just right".

Cooling :

Remove lower shrouds. The oil is the key assuming all the sheet metal is done right, deflashed heads, etc. External oil cooler, backup electric fan as required for the cooler, and I prefer a slightly increased oil pressure. I like 45 psi at the engine input from the cooler. If you really want to do it right, do the following when the engine is torn down.

Clean everything well
Heads, deflash, make sure no obstructions to air flow or oil flow
Block/engine case; deflash, enlarge drain back holes slightly, drill oil passages slightly bigger w/o going out of metal.
Deflash oil galleries.
Match case halves oil grooves/holes with each other & with bearing holes
Chamfer crankshaft journals' holes
Check all clearances to minimize friction /heat
And balance, etc. - anything that reduces heat
Use pushrod tube hole shields or baffle on deeper pan.
Deeper oil pickup
Clean out rear engine housing passageways.
Enlarge holes where prudent for better flow
Spec out oil pump
Spacer on pump spring (45psi at engine input- about 10 psi drop for cooler at front of car and its oil lines/hoses/tubes/pipes?!!!! So, 55 psi out of pump. BTW, the pressure loss can be much greater) and
External oil cooler (Large. Like from evaporator on GM truck.. about 3-4" deep and 9" by 9" this is overkill except for racing very high c.r. engine.

Retorquing bolts after heat cycle :

An additional comment would be that "things" don't slide well as they are being torqued down. Once cycled through a few heat cool cycles a certain amount of settling can occur. This is more likely to occur on used parts where the machined surfaces and interfaces are not as perfect ie. "smooth" as they originally were. Add to this Rad's comments and you can understand why some loosening can occur. As for overtightening, this is poor compensation as you may cause actual distortion of the parts which will then add to the typical loosening that can occur. This effect is most noticeable with the exhaust manifolds where even if you torque, hammer, torque, hammer etc while cold until specs are reached, you will quite likely find that once they have been heat cycled a few times

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that they can be down to half the previous torque. Having had a few gaskets leak and blow out over the years, particularly turbos, I go overboard with the following technique:
1. Torque the manifolds to spec.
2. Start up the engine and once the engine has warmed up crawl under and retorque again. I usually just let the engine run and enjoy the warmth. Of course the rear end is supported off the ground and supported properly.
3. Keep doing this until the manifolds reach a stable torque which can sometimes take three or more hammer and retorque sequences. You will be amazed at how much further retightening is often required. (By hammer, I mean take a block of hardwood and a hammer and use this to settle the manifold further into final position. Again, this is required because parts don't like to slide as easy when under pressure. Also, the three or more cycles holds for the standard gray type packings which do compress quite a bit once they get hot.) If you do this once you will probably realize that retorquing your cylinder heads after they have thermally cycled a few times is probably wise insurance. This extra fussiness has saved me gasket related problems 100% since I started doing it but it does take extra effort

Fan belt tensioner :

I have run all of the different types of spring loaded idlers on various Vair motors over the years. The one I recommend is --- None. For street use, on a stock 110HP motor, you will never need one. (At least not for several years) That said, however, you must do some homework before giving the car to your sister. Use a new belt, either an Otto (Clarks) Super belt, or a Gates (or is it Dayco?) 3VX560 - These belts stay on . (Please note VV members, I believe you when you say to yourself, "But I like the "XXX" belt. - Don't write me!) I know these two brands of belts. In addition you must have the fan pulley in good shape (tight bolts and not bent) You must adjust the two fan belt guides and you must correctly tension the belt. The "barely able to rotate the alternator fan with fingers" test is the easiest. The belts I've had good service with are, in order of my preference: Otto parts wrapped belt, Clark's Super belt (wrapped belt), Gates 3VX560, Dayco Top Cog 15565, and Gates XL 7560. The wrapped belts should be coated with silicone prior to installation. Seth

Valve adjustment:

The only consequences of this valve adjustment procedure is a delay in the bleed down of the lifters if you float the valves at high RPM. If the valve floats, ie, the spring is unable to return the valve as the cam/lifter returns to the base circle, a new clearance is created in the system. At this point the oil pressure inside the lifter takes up the slack. (to the amount of the preloaded 1/4, 1/2 or one complete turn) When the spring does return the valve, it finds the tip of the rocker arm lower (relative to the valve) than before. The valve will remain open a small amount. This kills performance because the engine will pop ignition back through the intake manifold, never a good thing. As soon as the valve spring manages to push the extra oil out of the lifter, the engine returns to normal operation. There is a direct tie between the amount of preload, the amount of oil filling the lifter, and the time to recover. That is why racers run almost no preload, usually less than a quarter turn. That is also why race motors clatter a lot on start up, as clearances stabilize and the lifters pump up to their highest point. - I use 1/8 to 1/4 turn on my street engines. A little clatter on start-up is okay for me. - Seth

Oil pan leaks:

Use paper gasket and make sure the sealing surface is flat on stock steel pans. If you should use cork nitril gaskets rather than paper, the trick is not to over tighten them. Torque the bolts to 30 inch lbs then with the engine hot I re-torque them to 40 inch lbs. No leakers here. Please note that is NOT foot lbs**.**

Rear housing leaks:

I find most leaks in the rear housing are from the oil pump idlershaft. oil will start to run out the top of the shaft where it is pressed into the rear housing; only happens when the engine (and oil) is good and warm, so it's a little tricky to catch. fix- knock the shaft out and reinstall it with locktite. *Larry Claypool*

Screw in Valve seats

California Street Machine.
99 Railroad Ave., Ste. D,
Suisun City, CA.
94585 (707) 429-1888

I saw him demonstrate this at the "Toss" a couple years ago, being a machinist myself, I was impressed with the tools he had made to do this with. Looked first class.

Engine studs:

Smitty says: Having replaced about a million studs (more or less) I have not yet seen an application where those .003 studs can be used. I don't know who dreamed them up in the first place. If you clean the holes and threads of the original studs thoroughly and use high strength Loc-tite that is normally all you need to do. Has anyone ever been able to use the oversize ones? If so , how did you get them in? Answer: Hot crankcase/chilled studs. Works like a champ! Oh, and be QUICK About getting them in! :)

CORVAIR RING COMPRESSOR (TOTAL SEAL)

This is what I have found to make installation a snap with the new tapered sleeve ring compressor: Position the screw clamp opposite the slot on the ring compressor. Orient the piston such that the wrist pin is on the same axis as the screw clamp and the slot. This is to say if you looked through the slot, you would be looking through the wrist pin and the screw clamp would be on the opposite end. Without the rings installed, and the piston aligned as above, adjust the ring compressor so the piston just slides through it. Install the rings on the piston according to the manufacturer directions. Lightly oil the ring compressor, the cylinder and the piston assembly. Center the ring compressor on the cylinder top. The larger end faces 'up', that is the band clamp would be on the bottom. Place the piston assembly in the ring compressor and orient the wrist pin as above, relative to the slot on the ring compressor. Guide the piston assembly in so the top ring is now in the ring compressor. Some times you may have to gently squeeze the top ring with your fingers to get it in the compressor. Now, just push the piston assembly through the ring compressor and into the cylinder. Depending on your ring package you may have to tap on the top of the piston with a small wood block or similar object to push the piston into the cylinder. Most of the time it is the oil rings that require a bit of a 'push' to get them into the cylinder. Once the compressor is set for one piston, you don't need to adjust it for the other pistons you are installing. If you have used other types of ring compressors, you will notice that you don't need to use much force to install the piston into the cylinder with this ring compressor. With some ring packages you can literally push the piston into the cylinder with your hand.

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Cam identification:

The majority of Corvair camshafts are identified with a stamped or cast-in part number. Unfortunately approximately 25 years ago, when you could still get new cams from Chevrolet, the cams of that period were not marked with any identifying part number. I think that I have a pair of new cams from that era. These cams were probably made by some supplier during the end of the Corvair parts availability and everyone was just careless about identification. When examining cams, we know there were only three different cams available for late models and only two of these were available new from the parts department. The 3 possible GM late model cams are:

3872304 is the service replacement for the 'performance' cam and standard in 180HP.

3839891 is the 110/140 cam except late 140 Powerglide RN type engines and some very late 1968 on engines. It hasn't been available new since 1965, you will not have one of these in new condition. 3839891 sometimes has the number cast in.

3839889 is the low performance cam, and is in 95's and some other engines sometimes. The lobes are very pointy on this one in contrast to other Corvair cams. Its easily seen by anyone. 3839889 often but not always has a number cast in. the other cams have much broader pints on the lobes. So, you know there were only two LM cams avail then. The 891s were never avail during that period. So look for the visuals between the 304 and the 889 cams. The lobes are different when you get the two side by side.

Late can be easily differentiated from earlies by appearance (i.e. the lobes will be narrow enough to clear the crank on lates).

EXHAUST

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Exhaust extractors:
I bought the larger ones. I had a local muffler shop weld tabs on them at the rear. We then used 1/2 of a stock 140 muffler bracket (the correct one for each side) and bolted the tab to the bracket. That way the extractors don't move AT ALL, which is *very* important.

Ceramic coating exhaust :: *Flame Sprayed Coatings*
A racing friend of mine worked at United Airlines in the machine shop. He coated the piston tops with ceramics for his 150 turbo. His oil temp dropped and his boost increased as the heat transfer to the lower piston was lessened. he said he could feel more boost, sooner, after the coating. Ceramic coating of exhaust pipes has several other benefits, among them long life. They also maintain good looks, as they are virtually unstainable. -Seth

(Late model turbo exhaust) -

Ceramic exhaust coatings:
MicroCoat, in Santa Rosa. I believe the guy's name is Bruce. Contact Lance @ Cal. Street Machine in Suisun City (99 Railroad Ave., Suite D). Phone #(707) 429-1888. I'm presently getting some turbo pipes coated.

Turbo Mufflers:
I have tried a Flowmaster 2 chamber muffler on a 180 turbo. The 2 PSI increase in boost is nice, but the noise level is a bit much for road use.

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FUEL

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FUEL PUMPS

Placement

1. place the pump below the floorpan of the car, between the outlet hose of the tank and the fuel line where it enters the tunnel. obviously, you must shorten the steel line.2 the positive wire for the pump goes to your fuse box, either the radio or center heat fuse location. the ground wire goes to ground, or to the special oil pressure switch you must purchase separately if you want the safety cut off. *Larry Claypool*

As per Larry c. post. years ago I put a electric pump from a Vega in the gas tank. think instructions are in the tech guide. also the oil pressure switch from a Vega will provide the necessary connections to shut the pump off in case of no oil pressure (roll over). the pump is noisier than stock but in this manner you will cure vapor lock. no matter where you put it the oil pressure switch is a good idea. *mike mann*

Fuel pumps

One of the first things I did when I bought my Corvair was to replace the original (I'm sure) fuel pump. Why did I do this? I have no idea. The original worked, and didn't leak. In the process of installing my replacement, I managed to break my alternator/oil filter mount, and munge the replacement fuel pump. After replacing both, I noticed an oil leak forming in back of the engine, around the distributor. I should have realized at the time that this replacement fuel pump had failed, almost immediately, and was squirting an oil mist out of a vent hole on the side. It still pumps gas, but the car stinks. I end up smelling like gas and oil every time I work on her. Why do the new pumps suck? It can't be because of the new fuel, or silly additives, since my original pump lasted 33 years. It's probably not shoddy construction, since they aren't really that hard to make. The only thing I can think of is that they reformulated the gasket material, poorly, and that is failing. 3 pumps in one year is not a good number (even if two of them were my fault). I'll be switching to an electric pump as soon as I can figure out how.

Electric fuel pump

I did a little hunting and found out the pump was used at least up to the '78 Monza. and definitely used as early as the '72 Vega. So that clears up the part hunt. The part number for the Master brand pump is E3900 The Delco number is EP30 if all my info is right. These in-tank electric fuel pumps were original equipment for carbureted GM cars with a 3.0 litre engine. They will not work for fuel injected cars (pressure too low). Many have bought them as a replacement for the Vega in-tank pump.

How to install the pump in the Corvair tank.

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1)Remove the sender unit from the tank and drill two small holes in
the plate holding the sender unit in the tank .
2)Cut off the filter screen as close to the screen as possible. GM dealers sell a sock to fit on the inlet side of these pumps, but my advice is to leave the sock off and filter the fuel outside the tank.
3)Mark the sides of the pump with a Plus and Minus sign and remove nuts holding on the green terminal block.
4)Cut two pieces of wire, one long enough to reach the top of the sender unit, the other long enough to come outside the sender and connect to the power. Crimp or solder small ring connectors on both ends of the shorter Minus wire and one end of the longer Plus wire.
5)Attach the wires at the pump using the nuts and washers that held the green terminal block on. Make sure the longer wire is on the Plus terminal.
6)Connect the pump to the end of the fuel line with a short piece of 3/8" fuel hose and two gear clamps. This places the pump under the gas gauge sender float. Make sure the pump does not interfere with the float and the pump is at the lowest point of the tank.
7)Next run the two wires up the supply pipe fastened with nylon ties. Attach the Minus wire ring connector with a bolt and nut through one of the drilled holes and bring the Plus wire out through the other hole. Seal the bolt and wire with gas-proof epoxy. Make sure the wires do not interfere with the float. Run the Plus wire to the 12 volt supply line. It should be run through a three way oil pressure switch so when there is no oil pressure the pump stops. I will send a circuit diagram with any pumps ordered.

Fuel Pump Hole Filler Tip

Last summer, when getting our latest Ultra Van (#408) ready for the road, eliminating the stock fuel pump was one of the first changes. Up 'til then, on my Corvair-powered vehicles, the pump hole had always been filled with an aluminum plug sold by the Corvair vendors. When I took the pump and push rod out, I had an inspiration. Why not cut the stem of the pump off. What is left was a perfect match for the hole, complete with "O" ring, except for a hole down the middle. This hole was tapped for a 3/8 inch by 1/2" machine screw. The top was filed flat and the sharp edges where rounded where the stem was cut off. Since not all pumps have the same size hole down the center, just pick the right size bolt to fill the hole. Using a little gas-proof sealant, the screw was tightened. With the "new" plug installed, 2,000 miles later, it has not leaked a drop, from my point of view it is perfect. *Norm Helmkay*

Oil pressure sender for electric fuel pump:

Three terminal Oil Pressure Sending Unit (OPSU) when used in your CORVAIR. Here's the Deal! It works nicely as a safety switch AND allows the Tell-Tale to function. Those of you who noted that it does not have a grounded terminal are correct. Some of them are labeled 'S', 'P', and 'I'. No matter... you can determine which is which with a test light. The only way to tell, for sure, if it works at all, is to put pressure on it and see that it switches. So, first mount it where the old OPSU was (by the Gen/Alt). With the motor off test any two terminals (battery leads and a bulb) and find the two that are together....note this. Start the engine and while it is running [BE CAREFUL OF THE BELT] do the test again and you will find that one of the first two terminals is now also one of the second two. That common terminal is the one that goes to the electric fuel pump (and is appropriately labeled 'P' on those switches. Shut off the motor. NOTE: the

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fuel pump will get its power from this switch so it also needs to have its negative lead (the one on the pump) properly connected to ground. Another NOTE; If you want a nice looking installation use the connector from a headlight (low beam, three prong) to plug onto your 3-term OPSU. Now the fuel pump is hooked up and you have no more dealings with that....electrically. How to isolate the hummmm is another story!
The terminal that was connected to the common one when the engine was OFF is sometimes labeled 'S' for solenoid. Tie in a small wire from your purple wire to this terminal.(the purple wire goes from your umbilical connector in the engine compartment, down to the starter solenoid). This will energize your fuel pump during the 'cranking' cycle. ALSO (please note...also) connect your old OPSU wire (from the Tell-Tale) to this same terminal. When you first turn on your key the light will go on because current can go from the bulb through your new switch and out to the fuel pump and through the pump to ground....lighting the bulb. Obviously as soon as the purple wire goes high the light will OUT but that little bit of illegal signaling will not hardly bother any but the "purest of the purists". As soon as the engine starts the oil pressure will switch the contacts inside of the 3-term OPSU so that the fuel pump is now hooked to the other lead and that one is hooked to the key, that's why it's labeled 'I', for Ignition.

If you want to be a little exotic you could just hook that term to plus as the only time that terminal is used is AFTER the engine is running. When you turn off the engine the lack of oil pressure will turn off your Fuel Pump.

More on Fuel pumps :

Well I know the oil presser switch for fuel pumps work well but can it be wired to the ignition system as well? so that it kills both fuel delivery and spark if the presser drops suddenly?

In a word, Yes, the power for the pump originates from the ignition and goes through the oil pressure switch after the pressure is up. There is a by-pass feature that uses the same dropping resistor by-pass supply from the starting solenoid to energize the pump during startup. When either the ignition key is turned off, or the oil pressure drops, the pump stops. There have been a few posts about leaking pumps recently. I experienced a couple of back to back failures on a rebuild kit and then a new pump, and decided to go with the electrical conversion. AutoZone sells a small 3-5 gpm (I believe) for about $20 (lifetime warranty) -- could have been $29, but regardless, it's in line with the price of a stock pump. Slip it in the rubber line coming out of the gas tank, wire it up, and you're done with that end. It's small enough to be supported by the line, but I recommend at least a couple of tie-wraps. Then, go to the Tech Guide and find the section on a "Dummy Fuel Pump." WARNING - don't follow the steps exactly, because they leave out a gasket, and you're looking at a disaster if you don't put one in. I wrote an article that was published in the Communiqué on this missing link about 3 years ago. If you don't want to mess with this, just remove the pump, plug the hole and re-plumb the fuel lines. Total cost is less than $40. I have not had a problem since with my 140.

Electric Fuel pumps:

Electric pumps work best if located very close to the gas tank, one placed in the engine compartment will have a very difficult time both when it needs to be primed (that is, filled with gas with gas in the line from the tank) and also maintaining good pressure. Also, you want an inline fuel filter in between the tank & the pump, to give it a long and trouble-free life--this eliminates using the original pump as a hidey-hole.

Electric fuel pump shutoff switch

One more thing - regarding the oil pressure switch I tossed the original SPST switch, grounded the "common" terminal of the "Vega" switch, hooked the original "oil pressure dash lamp" wire to the normally-closed terminal, and ran the negative (ground) side of the elec. fuel pump to the normally-open terminal. That way when oil pressure drops, the dash lite comes on and the fuel pump goes off.

Gas tank replacement :

I did find some things out that would make it easier the next time:
Be sure to get worm gear hose clamps with hex heads Be sure to get proper size hose clamps that won't have extra band material The vent hose measured 11/16" outside dia. The small fuel return hose for turbo measured about 1/4" and there IS a worm gear clamp that fits it. 1 1/2" x 3" filler hose 3/8 x 5" vent hose or special turbo "Tee" hose if turbo.

Have a long (18") 1/4" drive extension with universal and ratchet (socket to match your clamp) or many shorter extensions that add up to about 18" This is MOST useful on the upper end of the vent hose...but works well with others. Use this up from the bottom of the car for best (or least) angle of attack.

Have a long screwdriver and one of those long flexible parts pickers with the thumb push on the end. This helped greatly in arranging the clamps so they could be gotten to with the sockets. use the parts picker from the side through the hole with plenty of light. I found a 60 watt up from the bottom and a 60 watt with clamp from the side to do well. Also, I had to use an open end wrench (5/16" on mine) on the main filler hose. I had to reach my hand inside the hole and then extend the wrench to the clamps. You only get to turn it one flat at a time and you have to turn the wrench over each flat to get onto the next one. Takes some time in that small area with hot lights so keep your cool....the edge of that sheet metal pushes hard on your wrist.

Mine was the turbo with the extra fuel return line which was a real treat to get into position for tightening.

1.) The 1 1/2" hose gets the clamps put on facing the hole (at least towards the drivers side) put the screws to the rear and they get the open end wrench used on them when it's time. Make sure the clamps are snug when you slip them on the hose so you don't have to wrench that much... (true with all the clamps)

2.) The vent hose gets the upper clamp put on facing the rear of the car and on top of the hose, watch how long the metal tube out of the tank is and try and position the clamp as far down the hose as you can without missing the metal tube. This will help greatly in tightening it from the bottom with the 1/4" extension and universal.

3.) The lower clamp on the vent hose faces down on the front of the hose, this will be right by your steering shaft so you want it turned down low enough to clear it. (I tested mine and found it made a bad noise when the rusty shaft turned on the clamp) This one you can use the open end wrench on through the hole or you can get the 1/4" setup on it from the bottom.

4.) if you have the turbo with a fuel return line this one can tease you a bit... I found that after trying to guide the metal line into the hose (front to back) for a while, that it was made easier by removing the metal tube all the way down the tank and bending it to a

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better set up first. Don't hook it to the tank flange again until you are done with hose clamps.

That parts picker worked again from the side to guide the tube home and a shorter screwdriver then could be used as a lever against the front edge of the opening in the fender to push it into the rubber tube. Tighten with long screwdriver from the side. (easiest one of the bunch to tighten) Be sure to put the hose clamp on first facing the fender opening. Clamp can be turned with the parts picker until it points straight at you.

IMPORTANT:

Be sure and put the vent tube on the tank first (with clamp) then put on the large filler hose with main filler tube (loose). NOW you can twist the main filler tube clockwise and guide the vent tube into the lower opening of the rubber with a screwdriver. (don't forget clamp first) It really only took about 45 minutes if you don't count all the time use to figure it out..

Gas tank:

Putting in a new tank, eh? You'll score many points toward "paying your dues". First off, it's a good idea to coat the inside with a sealer while it's fresh. Next, purchase a replacement hanger hook, the original will probably break. You need only undo one side of the strap. Once one hanger bolt (hook) is removed, the strap can be swung out of the way and the other bolt unhooked. The sway bar has to be removed. Also purchase all new hoses and clamps. There are three; the big one for the filler, the medium one for the vent, and the small one for the sending unit. Push the filler grommet through the door opening, down the pipe so it will come out with the filler pipe. Install the grommet after everything’s back in place, from the outside. While the tanks out is a good time to check the front brake pipes.

Dummy fuelpump danger

Those of you who have tried the "Leakproof" Dummy Fuel Pump mod in the CORSA Tech Guide (page 17 Fuel-Air System) have probably discovered that there is a serious omission in the instructions. If you follow the instructions exactly, without installing the "recommended" fabricated metal plate on top of the middle gasket you will have a major fuel leak, either at startup or soon. This could result in an engine fire. You must install a gasket (solid) between the diaphragm spacer and the cap if you use an old base gasket in place of the old top diaphragm section. (I am guessing that this would probably be a popular solution since the diaphragm section would probably be bad like mine, in the first place. This third gasket should have been obvious since the instructions allow the use of two base gaskets with holes in the center. If you don't add a third, the fuel simply pumps up through the two holes and seeps (pours) out between the top of the spacer and the cap. The metal plate solves this problem in the short term, but changes in temperature and vibration might cause a failure.

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IGNITION

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Seth's perfect ignition

My recipe for a bulletproof ignition system for the Corvair. With two limitations. One - Corvair Distributor design co-driven with the oil pump by the crankshaft gear. Two - Mechanical Advance only - Vacuum not reliable for a race car. (My application) I took a good condition 140 HP Distributor (#330) I checked the advance curve on a dist. machine with a good set of points. I disassembled it and sent the housing and shaft to Dale engineering in Oregon. He installed a (1) sealed ball bearing in the housing and re-assembled the distributor housing/shaft. I modified a point mounting plate as follows: I removed the rotating plate which normally holds the points and tossed it. I then punched a large hole (About 1.25") offset in the remaining plate. I ground the 140 distributor cam OD round to a diameter which (closely) matched a Chrysler 6-point reluctor ID. (A slight press fit) When assembled, one of the points of the reluctor was aligned to the rotor tip. I installed the complete advance system and the modified cam/rotor mount. The modified point plate was dropped over the reluctor and bolted down to the housing. The 1.25" hole is offset to allow material for mounting the Chrysler pickup. The stock pickup is mounted down to the plate positioned so that the reluctor point/pickup are aligned when the rotor is pointed at a distributor terminal in the cap. The stock Chrysler wire snakes out the stock distributor recess, with a slight increase in the mating distributor cap clearance hole. I use a Blue Streak cap and rotor. The magnetic pulse output is connected directly into an MSD 6AL Multi-spark ignition system. This unit has an integral rev limiter and will fire any good hot coil. MSD has a recommended coil list. I use "Silicone Wire System" wires, of course, a stock resistance core street set, except for a longer coil wire due to location. I guess something could go wrong with this system, but not much is there to go wrong. MSD's are almost standard equipment in today's race cars. With a couple of exceptions, usually crank fired cars, most Stingers around the country are running this set-up, I've
built about twelve, and others have built them too. I can't recommend it for street use because of the lack of vacuum advance, But if you're running Webers, no feed is available, why not? This system is installed on my Lola, as you might have guessed. By the way, I run ND (Nippon Denso) plugs. They are of typical Japanese quality, still have a listing for the Corvair in their catalog!!

Regarding the Pertronic ignitors

I took the resistance wire out of my feed circuit on my convertible. At the left front of the engine compartment lives a firewall attached multi-pin plug. In that plug is the feed including the resistance wire to the coil. Using the correct tool, a tiny screwdriver, I pulled that wire from the harness. I then replaced that wire with a wire from an old harness and ran it around to the coil. This gives 12V to the coil, and doesn't use the starter feed/bypass at all. I am using this with a Perlux Ignitor and this setup has been quite reliable.

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Pertronic ignition failure:

I agree with Harry on this and that's why I always recommend you carry your old point plate with points attached and set. If the electronic system fails, it takes only a few minutes to swap plates and you're on your way again. IMHO You also need to have the condenser to reinstall if it has been removed for the conversion to the electronic ignition

Backup for electronic ignition :

I can see that it's time to trot out my "Electronic Ignition" installation primer. (I promise it has nothing to do with new plug wires!) How to install an electronic ignition in a Corvair.

1). Buy a new set of points and verify you have a good point plate.
2). Install the points/condenser and set/check the dwell.
3). Remove the point plate with the points and condenser and wire attached.
4). Put plate assembly in a zip-lock bag and place in glove compartment.
5). Install electronic ignition system.

You now have a get-home mode when (not if) your electronics fail. Note - I still recommend electronic ignition, I just don't trust it completely.-Seth

Perlux ie bypass resistor

Comments on the coil selection. When I have installed the Per-Lux Ignitor on the late model Vair, I have always bypassed the stock dropping resistance wire, essentially feeding 12 volts (or Battery voltage) to the coil all the time. The specs for the Per-Lux say it can handle 8 to 16 volts. The "boost" you referred to is really a return to the 12 volts for starting, which then normally drops back to the 8-9 volts for running. I know you can't just bypass the resistance wire for normal use, that will kill the points in short order (50-75 miles?). But with the Per-Lux you essentially get the "Boost" all the time, if the wire is bypassed. Right? PS I used the high windings ratio Borg-Warner coil on my installation, It fits in the stock bracket and worked like a charm. - Seth Emerson

More on Bypassing resistor

Well, that's what I did on my Corsa. I cut the resistance wire right at the firewall connector, put a crimp splice in it, and ran the power supply lead to the module from the splice. This means that there's about 1" of the four or so feet of the resistance wire in circuit to the supply lead for the module. Since the resistance of the wire is constant per unit length, and the resistance wire has a total resistance of only 1.8 ohms (according to my '61 shop manual), I think we can safely say that the added resistance in the supply circuit to the module is negligible, and because the current draw of the module is slight (voltage it needs, but not much current), it shouldn't make any practical difference on the harness load. I am running an Accel super-stock coil, which does have the eight volt primary winding, like the stock coil does. I did this because I wanted starting boost for cold starts, and I still wanted 35-45KV available to the plugs, which is roughly twice what the stock system supplies.

There's no harm in running the inline resistor with an 8-volt primary coil and just not bothering to connect the solenoid lead, btw. It would only make a difference on really cold mornings when battery voltage is low. If you really want to be rid of the dropping resistor in the circuit, or you are convinced that there's really more out there than GM ever found power wise, probably the best high-power route would be to use one of the super output coils along with the Allison (Crane) module. There's no stated current switching limitation on the Allison module, which means that you can do things that no sane ignition designer would do, provided you mount the module someplace breezy and cool. The problem with using the Ignitor for really power-hungry systems is that the switching transistor is rated for 12 amps continuous load when properly heat-sinked. There's basically no heat-sinking on the ignitor package at all, and no easy way to add any. Hence the recommended 6 amp current limit. Which means that the total resistance of the ignition primary circuit can't be less than two ohms when using the Ignitor. So you need a little in-line resistance with coils like the Accel Super Coil or a GM HEI coil (stock or aftermarket).

If I remember right, the resistance on both the HEI and newer GM coils and the Super Coil is about 1.4 ohms. IF you want to do like GM did with HEI, etc and push 12V through this, you can do so with the XR-700 module just fine--it's only about 8 amps continuous.

Probably my favorite good and cheap ignition upgrade is to mount one of those potted external ignition coils anywhere convenient. These coils come original on just about any GM product from the post-HEI, but pre-distributorless ignition era. All of them have a primary resistance of about 1.4 ohms and are designed to be fed a straight 12V. Output voltage is about 50KV. If you want more than this, you'll have to get one of the aftermarket coils for this setup. As far as I can tell, the Accel Super Coil is basically one of these in a fancy package.

The ignition supply lead that runs to the firewall connector from the ignition switch is 20 awg. This puts a practical limit on the current draw that can be supplied directly from the wire. It would be worthwhile to take a voltage measurement at the firewall connector with a running engine and see just what the voltage drop is from B+ on the long run up to the switch and back. IF you find that there's more than about a .3 volt drop, I'd wire the switched lead as a control line for a 30 amp relay running directly between the battery terminal and the B+ supply to ignition.

Comparisons of electronic ignitions:

There has been some excellent discussion on electronic ignition conversions for our Corvair. (hats off to you Rad and others!). Most of it comes down to 'which' system is 'better'. As for the Ignitor and Crane, both units are very good. It really is a personal preference as to which one is 'better' for your needs. Here’s a little check list which may help.

	Ignitor	Crane
External Boxes required?	No	Yes
Current Limited	Yes	No
Trigger	Hall Effect	L.E.D.
Trigger, Hermetically Sealed?	Yes	No
Resistance to 'elements'	Excellent	Good
Proper Install in Corvair	Yes	Yes w/extra univ. mount kit.

As for voltage required, or needed at the plugs there is a limit. Not withstanding the wires, distributor cap, etc. you need a specific voltage to fire the plugs under the worst load requirements: Low speed, full throttle for normally aspirated cars; boost conditions with Turbos. You will not get any more 'power' by feeding more voltage to the plugs, than what is needed during the worst load conditions. So, if you need 40KV and feed the plugs 80KV, you get nothing more.

I have used both the Ignitor and the Crane; both are good units. If you want a 'stock' looking system use the Ignitor. If you are going to be exceeding the current limit of the Ignitor, use the Crane. I have not come up against the current limit with the Ignitor. Most installs use a H.O. epoxy coil (45KV, looks stock), good wires, epoxy cap and rotor. I have also run C.D., MSD, hybrid and home build spark ignition systems triggered
by the Ignitor - no problems. Remember, in these cases, very little current is required to drive these devices. The Ignitor or Crane is really acting as a low current switching device for the spark ignition systems.

If you do use anti-seize,

DON'T use the original torque spec. Those were for "clean & dry" threads. The Anti-seize reduces the torque you want to stop at by quite a bit and if you don't cut back, you could damage the threads. There is a rule of thumb on the reduction % somewhere, but I can't seem to recall what it is (it's a big reduction... something like 50% maybe). An old timer told me to use copper anti-seize to allow good electrical connection to the threads. He told me it's common practice in aircraft engines. Champion sells a special anti-seize for spark plugs which I got at a NAPA store. It shows machine oil 35% reduction, anti-seize (graphite) 45%. Copper anti-seize is not listed. My engineering sense (an oxymoron if there was ever one) says 10-15 ftlb. should be sufficient with anti-seize.

The thread chasing advice Dan mentions is also wise. Remember that the
heads were designed for FF (like 44FF) series AC plugs which are "fully threaded" along their length of engagement in the hole. MANY but not all of the "replacement" plugs (like the F series, as in 44F). Have fewer threads. If you run these for a while and don't chase the threads prior to installing full-threaded plugs, you will run into a wall of carbon in the previously empty threads. This is bad news and cause thread damage. Boy, do I we miss l.c. and his famous advice---LOOK IN THE TECH GUIDE! I found three places in the guide so far that recommend using anti-seize. I have used it based on common sense (steel into aluminum) with no adverse effects that I know of. I say use it and worry about something else! Before installing the new plugs, it is recommended the time be taken to carefully inspect the threads. Competition is fierce among the plug manufacturers and they generally cannot afford to spend a lot of time and effort making perfect threads every time. One small burr on a steel spark plug can wreak havoc on the threads in the aluminum head.

Be sure to use anti-seize compound on the threads. Do not use normal grease, as this may hamper proper grounding of the plug, and it also may get hot and form a crust that makes it even harder to remove the plugs. And do not use a graphite-based lubricant, as graphite may react with the aluminum and weaken it.

When installing spark plugs, it is helpful to use a piece of 3/8" hose to get them started. Press the hose firmly over the top of the plug and use the hose to feed them into place and thread them in finger tight. Then the hose can be pulled off and a socket used for final tightening. There are warnings not to tighten the plugs past 8 ft-lb. of torque. 8 ft-lb. is not enough to turn the plugs loosely in the threads unless they have been recently cleaned and chased, but the point is well taken. It is an aluminum head, and tightening "three grunts" is both unnecessary and costly. Just tighten until you feel them seat, make sure they're snug, and quit. *AC Delco* are not only not "pro" antiseize, but are actually anti - antiseize. They say the stuff, because it reduces friction, can lead to overtightening, even when using correct torques. This can cause stretching of the s/plug shell, can result in the plug going too far in (is this a bit far-fetched?), and can result in threads being pulled into places where they shouldn't be.

Any dummy can over-tighten almost anything. It surely would be smarter to simply provide a revised or adjusted torque value which accounts for the lubrication from the anti-seize. As far as distorting the plug to the point I will actually extrude an extended length of plug through that hole in my cylinder head - pure balderdash in an aluminum head. I am absolutely positive that long before I distort the plug to that degree - I shall have certainly stripped the much softer threads in the aluminum head.

If either of these esteemed manufacturers will warrant in writing to replace the cylinder head should their spark plugs seize-in or gall the threads of the aluminum head, I might consider their advice as relevant. Until then, however, I shall continue to use anti-seize in this application. Helicoils are a huge pain in this application as are Keenserts. Paul Glaves

Ignition:

Seth writes: Can it be done? - Yes - Should it be done? - Some debate exists! To use a 2.8 V6 unit you would have to go with a fairly early unit with mechanical and vacuum advance, i.e. non-computer. I've heard the early S10 pickups use these (hearsay) you could connect the output to an MSD or other magnetic triggered unit. The earlier straight-6 unit is large and requires more room in the engine compartment. I just don't know what the swap buys you. - Seth Offhand, I'd say going to HEI would give all the usual elec ign advantages - no more adjusting points, more accurate timing, no point bounce, hotter spark. However, the HEI is not an especially 'hot' unit, at least not compared to an MSD box. There is also the complication of needing to re-curve the HEI dist to match the Corvair curve. One advantage of using an HEI is the bugaboo of EI systems in general, reliability. Although the aftermarket EI systems have mostly spotty quality reputations (MSD is one of the notable exceptions), the OEM systems are, in my experience, extremely reliable. IMHO, the mopar EI conversion sounds lots better - you get to keep the stock Corvair advance curve (John Moody has catalogued something like 40 slight variations in the point cam profiles), you can just use the pickup to trigger an MSD or other aftermarket ignition or you can buy mopar's hotter 'chrome' box, and you get OEM reliability, plus if the silly thing does break you can buy parts pretty much anywhere.

I took the resistance wire out of my feed circuit on my convertible. I then replaced that wire with a wire from an old harness and ran it around to the coil. This gives 12V to the coil, and doesn't use the starter feed/bypass at all. I am using this with a Perlux Ignitor and this setup has been quite reliable. - Seth - Should give a *MUCH* hotter spark, probably almost double the coil output! I'm curious as to what coil you are using and how long its been installed in this configuration, since from what I understand, a coil (ie transformer) is rated for a certain primary voltage based on _mechanical_ design parameters for withstanding stresses created by the electromechanical forces inside the coil. In other words, when you double the primary voltage you are at least doubling (I don't remember the equations) the forces in the coil that are trying to tear itself apart. If the coil is rated for the full 12V, could you please post the manufacturer, P/N, & supplier info? I'm installing an Ignitor electronic ignition module in my Lakewood project, and I'd love to run the coil @ 12 volts - wiring's less complicated & the spark's hotter - but I don't want to sacrifice reliability of the coil for more performance. Thanks for any info.

My silicone plug wires work with any spark plugs so I have no axe to grind. I place Split fire plugs in with the Judson "Electronic Magneto" and other types of bolt-on solutions. I can see no obvious benefit. Spark plugs cannot create horsepower. A special ignition system (a complete system from timing generation to spark) can mask other shortcomings such as poor fuel distribution, etc. I can't see the $5 plugs worth the money. RAD - have you a emission engineer's insight? There is a psychological point here- If people spend the money, they want to see results. They may unconsciously change their driving habits and achieve them. -Seth. Multiple ground electrode plugs have been around a *long* time. In fact, airplanes just about always use the things because lead fouling can grunge up plugs with much more catastrophic results than in a car. Can a sparkplug alone make more HP or MPG? Sort of. If the plugs you replaced were grungy or really worn, sure. Or if the new plugs are extended-tip and the old ones weren't, I might expect to see some advantage as well. Looking at the sales literature for the spitfire plugs, their principal claim to superiority is supposed to be less shrouding of the plasma cloud created by the spark that actually starts mixture burning. This idea isn't total bologna--it's why car manufacturers switched to extended-tip plugs back in the '70s. Further, having misspent a lot of my youth reading hotrod magazines, I can tell you that spark plugs do make a measurable difference in quarter-mile times on bracket cars. The conclusions I remember (which should still be valid today) are: 1) more electrode gap was better up until the point at which the rest of the ignition system could no longer reliably force a spark to jump across it. This was using HEI systems on mid '70s bracket Camaro's, and they found that plug gaps in the .050-070" range produced lower times than the stock recommended .035-.045". The factory reasoning behind the narrower gap was that the car wouldn't get misfire when the typical driver a) let the plugs go 70,000 miles without even a regal, b) never changed plug wires, c) never changed cap and rotor. If you promise to be a good boy or girl racer and keep things up to snuff, you can run more gap, which will make more power. I'm running .045" in my Greenbrier with a hotter coil and Crane/Allison ignition (running NGK plugs too, I think...). Note that none of this applies to a car with points, because you aren't making the voltage that you will need to jump more than about a .040" gap. 2) Electrode position made a difference, albeit a subtler one. They found that if they marked the plugs with magic marker where the ground electrode was welded to the head and bought two sets, they could shift plugs around enough that they all faced the same way. The orientation they aimed for was with the base of the ground electrode toward the top of the chamber, so that any swirl left over from intake valve closure would be swishing right through the plug gap without restrictions. Result: Reproducibly lower elapsed times, though not by as much as with the gap change--the effects of this should be maximum at full throttle, BTW, so cruise economy wouldn't benefit much. 3) Those clever Swedes (SAAB) have been at it again. Look at this month's _Automobile_ They've done away with the ground electrode altogether and are using a point on the piston as the ground electrode. This would have to be pretty close to optimum as far as spark positioning goes, especially on a pentroof chamber. They cite emissions and performance improvements as a result, partially from the rather clever fact that conditions that reduce peak cylinder pressure also naturally increase the spark gap... Having said all this, why am I running bosch platinums in one car and the NGK's in the other? Because I'm leery that the split-fires might encourage preignition from that web-foot ground electrode they have. And I doubt that they're twice as good as Bosch platinums, with which I have had superior results in a lot of vehicles, but they *do* cost twice as much. If you want to improve performance by tweaking the ignition system on the Corvair, buy: 1) an electronic ignition. Faster rise-time makes the coil capable of generating more voltage. Also, step 2 will eat your points. 2) lots of coil. I run the accel super-stock coil on the Greenbrier because it's space limited. I'll probably run a super-coil on the Corsa. 3) more plug gap. Keep opening them up until you get weak knees or full-throttle misfire. Remember, though, that you'll have to keep the rest of the ignition system in better shape or you'll get misfire--probably on a dark, rainy night, because the rain has broken down the insulation on your plugs, cap, rotor, or: 4) really good plug wires. Carbon-impregnated cotton and plain rubber insulation won't do it when you're putting out twice the voltage of the stock system, and using it. We do have honest, helpful vendors among us who can help with this last, at least. (So, Seth, do I get a discount?) If you're looking for that extra 1% or less, you can try aligning the electrodes. I don't know if it will help or not. I am certain that the changes I've made to the Greenbrier's ignition system were somewhat responsible for the 5 mpg increase in average economy I've seen since I got it.

Ignitor wire slicing

Quit trying to decipher the instructions and just put the red wire on the coil Pos. terminal and the black wire on the coil Neg. terminal after you remove the original point plate. Be sure and cut the notch in the cap. Set your timing and be on your way. *Lon*

Ignitor info:

What is true is that the Ignitor needs is an average current draw of less than about six amps (this including a large safety factor). Which means that (assuming 14 volts in the system) the total resistance of the primary coil circuit (wiring, ignitor, and coil primary)should be about 2.3 ohms.   Now just how you achieve this 2.3 ohms is up to you. The generic point ignition import car coil (as used on VW beetles, for instance) has a high enough primary resistance that no dropping resistor would be required. If you use a supercoil, you'll need to add some resistance to the primary circuit, because I (maybe wrong) remember the primary resistance (DC) of the Supercoil to be about 0.7 ohms.

In any case, it's a big mistake to go with the resistor wire (except '62turbos) supplied by GM without adjusting for the lack of points and newcoil. Spend a little time to measure and make things right, and you'll note the difference every day you drive the car

Bypassing resistor

I'm reading up on installing the ignitor in my Corvair. For the 12V positive wire, it states to cut the resistor wire about and inch from the connector. From there, I solder a piece of 16 gauge wire to the stub and run it directly to the positive terminal on the coil
Bolt the red wire to the positive coil terminal and the black to negative. THATS IT.

Actually - Splicing into the system should not be necessary. On my Convertible, I took an old engine wiring harness apart and removed one of the long wires from the body feed connector, including the terminal. On the car, I pulled the body connector open, removed the resistance wire feed and replaced it with the wire I scrounged from the old

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harness. That is now an ignition switched 12 volt supply, independent of the resistance circuit or the starter bypass. I ran that wire around to the coil and fed the Pertronix Ignitor a full 12 volts. For safety sake, I folded the resistance wire back onto the engine harness and taped it up to protect it. This works fine and is easily returnable to stock. - *Seth Emerson*

All I did besides put the red and black wire on the coil was to put a jumper across the ignition dropping resistor. This way I get the whole 12 volts, but everything is still there if the "Ignitor" breaks down and I have to put the old point plate back in and pull the jumper.

The weak link

in the stock system at high ignition outputs is the small distributor cap. The small cap needs to be kept very clean to prevent cross fire with H.O. systems. In that matter the 'small' GM HEI conversion would be the best bet. Since you will be using the SafeGuard, you will have plenty ignition output for boost pressures in the 12-16 psi range. The SafeGuard includes a H.O. ignition system with active dwell control. The output of a SafeGuard delivers 62% more coil output than a GM HEI system. This gives you a big, fat spark, just what a turbo needs. If you would be running more than the above boost pressures, then you MAY need another ignition amplifier. The MSD would be a fine choice. My suggestion would be to run the system first and see if you need the MSD. The SafeGuard will easily fire any other aftermarket ignition amplifier if required. Get a set of good ignition wires, maybe Seth's,

My suggestion for a hot setup for your turbo given the above, would be as follows: Boost output around 15 psi - Dale rebuilt distributor with GM or Chrysler Mag pickup to replace the points. A SafeGuard individual cylinder control ignition system triggered directly from the Mag pickup. Use a GM style HEI coil and Seth's wires. Boost output over 16 psi - Maybe consider a 'small' HEI distributor conversion. If you need more ignition output, install a MSD. But I need to know which spark plugs to ask for. Are the AC44FF's still the best choice?

No, and they are hard to find and expensive. The W8AC works with either standard or hot ignition. ie pertronix Electronic Ignition and a 40K volt coil. With that hotter ignition system you should use a platinum tip plug like the Bosch W8AP and gap them to a higher than stock gap to make use of the higher voltage available. I find the Bosch plugs at my local Autozone and gap mine to .050 and they work great. IMHO I agree with Ed about regapping, and have a personal preference for Bosch Super W8AC (7502) plugs, probably because I can get them for a buck each. I'd encourage you to ensure that the system is balanced. An Ignitor alone is ONLY a points replacement. Adding a 40KV coil does little unless you also bypass the ballast resistor. With this done, you can open the spark

gap a bit, but the stock wires, and maybe even the dist cap won't be able to fail. I run a system with an Ignitor, 40KV coil, bypassed ballast resistor, Seth's silicone wires, W8AC plugs gapped at 0.045", and a NAPA premium cap and rotor. In a year and a half I've had no problems I can trace to any one component, or the system as a whole (I'm pretty sure what I thought was an ignition problem was actually a carbon-buildup, over-compression problem). With all this, I'm pretty sure the Ignitor is actually the weak point in the system (the electronics are fine, but the "points plate" it sits on is a flimsy POS). I like to use the W8AC (copper tip) with the stock ignition and the W8AP (platinum tip) with the

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upgraded 40KVA Pertronix system and, of course, Seth's wires.

Re: Bosch Spark Plugs

The C's are a large copper center electrode. The P's are a small Platinum one. Theory was that platinum was harder than copper, would wear better, and was a better conductor of electricity. In most cars, this worked well. However, in Audis, Chrysler 2.2 products, and Corvairs, I've been unable to get them to run. IF the Corvair was tuned perfectly with a fresh coil and/or electronic ignition, the Platinums would run _okay_... but the Coppers always ran much better. 9 times out of 10 when a Corvair would come into the shop with a "poorly running" complaint, simply adjusting the points, synching the carbs and changing the plugs to Supers fixed the problem. The Platinum is a good theory, though. In my highly boosted Audi, Platinums won't run at all, Supers are very poor, Tri-electrode Supers (DTC) are decent... but the real ticket is Bosch Platins. Large center electrode platinums. So the electrode size was the real issue all along! The downside? $25 per plug. Several people on this list appear to run Bosch Platinums with no problems. In my opinion they are the extreme minority. I would recommend that all of you who are using Platinums with no apparent problems to invest $6 in a set of Supers and see if the car doesn't run better without any other mods. I have not yet heard from ANYBODY that's tried this and wasn't happier with the cheaper Supers. The Supers are Bosch Supers (old part number W8AC). These are now the basic Bosch plug

Nippon denso plugs

On street driven Corvairs as well as my race motor, I have used Nippon Denso (ND) plugs for several years. They actually recommend a plug for the Corvair in their catalog, or did, a few years ago. They have both a standard tip and a projected tip plug available. I am pretty sure these are "air-cooled-VW-common" parts. The part numbers for most motors are W16FSU for standard tip and W16FPU for projected tip. The standard tip plug looks identical to an AC44F, it is not threaded all the way down like an AC44FF plug. They also make a colder version W20FSU. I ran those in my Lola when it had the Turbo motor. I switched to the W16FSU when I installed the Webers. I run those on my street 140 as well. They are typical Japanese quality and go on sale many places regularly. Seth

Bosch Super Platinum W8AC

are the 'correct' thread size, tip recess, and very close on heat range for a cross over from AC44FF. The main advantages are that they are in stock at every Autozone, cost $0.89 each, and won't stop being made for a long time. I avoided the platinums on the advice of several members of this list (and other sources). The most talked about advantage of platinums is low maintenance and long life, which doesn't really matter since I have to pull the plugs to clean the soot off every few thousand miles anyway.(I know, the too rich condition is on my list). The plugs work great. I run them at 0.045" gap on a 12V flamethrower coil, Seth's wires, and an Ignitor. Just a caveat, Torque 'em conservatively and remove them when the engine is cold.

Checking Centrifugal advance:

Basically, all centrifugal and vacuum advance systems operate the same way, and as the distributors age, they suffer from the same problems, no matter what the make. Centrifugal advance is a function of weight versus springs, with stops thrown in for good measure. Over the years, the springs wear or break, and are often replaced with something that looks the same, but has a different rate. The pins and stops wear, so what do you really have?

The only way to really know what you have, even if everything is new, is to put it on a distributor machine. In addition to plotting the advance curves, it will also tell you how worn your points lobes are, (Not a factor if you go electronic), as well as the bearing/bushing wear. If you don't have access to a machine, you can do most of this on the car, if you can accurately mark your harmonic balancer for about 40 to 50 degrees before Top Dead Center. Marking it every two degrees should do it.

Use an accurate tachometer, a vacuum pump with gauge, and a timing light. With the vacuum advance disconnected, run the engine at idle and make a note of where the timing marks are. Then slowly accelerate the engine until you just see a shift in the timing. This is the RPM that your centrifugal advance starts to come in at. Note this RPM, and then increase your RPM in steps, noting the advance shift in degrees and the RPM at each step. When further acceleration yields no more advance, you have reached the top of your curve. Plot these points on a graph, and you have a picture of your centrifugal advance. It's actually kind of fun. To do the vacuum advance, let the engine idle, make note of the timing, and hook up the vacuum pump. Pump away until you just see a timing shift, and make a note of the gauge reading. This is the start of your vacuum advance. Increase the vacuum in steps, and note the gauge reading and timing shift at each step. NOTE: AS YOU BRING IN VACUUM ADVANCE, AND THE ENGINE RPM INCREASES, THE CENTRIGUAL ADVANCE WILL START TO COME IN. YOU MUST REMEMBER TO SUBTRACT THE CENTRIFUGAL ADVANCE CHANGES FROM YOUR VACUUM ADVANCE AS THE ENGINE PASSES THOSE RPM'S. USE THE FIGURES FROM THE GRAPH YOU MADE ABOVE. Of course, you could disable your centrifugal advance to do the vacuum check, but its too late on a Saturday night for that explanation.

Put the vacuum advance info on a graph, and now you have a complete picture of your distributors advance characteristics. Most of the time, the only change for centrifugal advance is the springs. Stiffer, softer, different lengths, sometimes with spring ends that work like a slot, sometimes the springs are matched, sometimes they are different. The maximum centrifugal advance can be changed by repairing or modifying the stops. Weight can be added (solder) or removed (grinding/drilling) from the advance weights for fine tuning. To change the vacuum advance curve, you just have to change the unit, but you can usually do some work to change the maximum vacuum advance

Spark plugs:

Both Nippondenso and Nippon Gakki K.K. (NGK) have pretty decent plugs for the Vair. I'm running the denso's in the van and have had good luck with them. But with the Allison ignition and hotter coil I believe that a piece of coathanger wire with tape around it would probably work.

The Corsa has a stock ignition (still haven't gotten an electronic setup yet...) and I found a noticeable improvement in everything when I switched to Bosch platinums from AC 44F's. Since this is a more demanding application than the 'brier spark energy wise, I would recommend these as a first choice. The Denso and NGK catalogs both list applications by vehicle and AC 44F cross-reference. You don't actually want a 44FF, because a) they are not made anymore and b) the only difference between that and the 44F is 1 mm of extra thread, which just sticks down into the combustion chamber and causes preignition anyway. The Bosch catalog has an awful cross reference any way you look. I ended up by actually crossing the heat range and reach data individually and ended up with a W8AP or WR8AP. Despairing, I looked on the shelf (the guy let me behind the counter at Western Auto once I told him I had been a red-shirt over at Advance in my College days), and discovered a bunch of the things. Turns out (as I should have remembered, since we own one) that W8AP is the standard plug size for VW beetles. They're not resistor, but as long as you have resistor wires this shouldn't matter. And they do run just dandy in my Corsa. Definitely my first choice on any Corvair plug job from now on. Put some of Seth's wires on it, an electronic ignition, a big coil, and set the plug gap to .055-.075". This should give you all the bang you can use

re Sparkplugs:

>NGK - B5HS
>NGK Fine Wire - B5HV

I use the NGK B5HS in my '66 500 coupe (the one with the 3.1 liter engine) and they are great! That combined with a Chrysler ignition from Dale's + a good set of plug wires = no ignition problems so far.

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INTERIOR

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Steering Wheel repair.

I believe the steering wheel repair stuff from Clarks is PC7, At least that is what is in the kit that Eastwood sells. It's available at most hardware stores. It is a heavy bodied two part epoxy that cures slowly. I've used it and it works good. Used a dremel tool to vee out the cracks, cleaned them good with brake cleaner and worked the pc7 into each area. Before it was completely hard I trimmed the excess with an exacto knife. When hard, finish sand. Works good.

Conv tops window,

Here in sunny southern Calif. the sun plays havoc with the plastic window and in a year or so turns it brown. So, in my 65 CORSA convertible, when I had a new top put on about seven years ago installed a rear window frame and new glass from a 41 Plymouth convertible that I picked up at the Ontario auto swapmeet. I had the frame rechromed on the out- side and painted on the inside. The glass I added is tinted dark gray. In order to install the frame my installer had to make a double thick curtain made of the top material and a heavy duty plastic (nylon) zipper. The zipper works so much better than the brass zipper on stock installations. To put the top down, I first unzip the back window and lay it down in the boot then fold the top down on it. I have a power top and there is no interference. In warm weather I always drive with the window down. You really get great air flow through the car that way. So, does that make me your hero? Keep the zipper lubricated and it will last a long time IF you unlatch the two front hooks and push back the top a few inches to take the pressure off the zipper when you are opening or closing it.

Turn Signal Arm

Here’s how you repair the tele wheel column its a Piece of cake. I did it three times.....on my early '65 setup

1st time to check what was broken (I also saw the $122 part ;-)
2nd time to install the new part (in my case the cam, a $10 item :-D
3rd time to get the horn to work which never worked :-(

Get the logo off, it's a click system, pry carefully Remove the 2 very small screws that hold the adjuster ring to the central screw (check how they're positioned) Remove the central big bolt and take of the adjuster ring Remove the 6 small screws holding the wheel itself on the adapter. If I remember correct there now are three bolts for the horn mechanism, two regular and one is a positioning pin for the wheel. Remove the spring that's sticking out underneath Loosen the nut holding the adapter but do NOT take it off completely! The adapter is spring loaded. There is a locking tab on the nut but I just turned the nut and it bend away easy. Fit the puller (you've got one right?) and loosen the adapter. If it's loose remove the puller. Press the adapter in by hand and remove the nut. You now see the mechanism where hopefully only the plastic cam is broken. Reassemble in reverse

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If you check how the adapter is on the column and the wheel on the adapter it's easier to reassemble correct again. Also check the turning range of the adjuster ring. It should fully fasten the telescope column. I hope I remembered the right sequence, it's been a while and I tend to forget bad things easy.

Bulbs:

Since I was replacing my engine harness today, I decided to deal with one of my few dislikes about the Corvair - small, dim taillights. I am converting my '65's backup lights to tail lights by paralleling new sockets with the existing dual filament bulb sockets. I assume this will drive the flasher crazy, but Larry's article in the tech guide gives a number for a flasher for 3 1157 bulbs. My **question** is, if I go to brighter bulbs (like 3057s), will the little spring contacts in my tele column directional signal switch turn from contacts to fuses? If not, does anybody have a suggestion as to what flasher to use with the brighter bulbs? **ANSWER** The 3057 bulbs will run off the same flasher as 1157's although the increased current draw might increase the flash rate. You could also install a #552 heavy duty flasher that will flash 2-6 bulbs at constant rate regardless of load. The #552 is handy in that it can be easily modified to adjust the flash rate.

You may want to consider converting the backup lights into additional stop/tail function lights instead of stop/turn/tail. This can be done by running an additional wire from the brake switch to the rear of the car or by using the converter from a center brake light. This way you maintain a continuous brake light on each side of the car while the outboard light is an interrupted turn signal. The stock switch should be able to run 4 bulbs without meltdown , as this was done on other gm cars of the era. in my article on flashers, I note the number for a 4 bulb fixed load flasher if you find the 3 bulb unit is too fast with the bright bulbs. you *could* use a 'universal type flasher like a 552, but you'll never know if 1 bulb is not working until it is pointed out to you First of all, I also have done the dual '65 tail light conversion. (On a '66 car at that). I've had no problems with the switches, fuses or blinker lever. The only problem is that the directional flash with an increased frequency and decreased duty cycle. This is due to the increased current draw. I use 1157s all around and find them to be quite bright, due to a clean ground and new light holders. (I think the 3057s are on the order of $7.00, each. Ouch).

Brighter bulbs should be no problem. Pep Boys has an electronic flasher conversion that has significantly lower on resistance. If you want REALLY bright bulbs, go to
http://www.htnews.com/comptltd/parts.html
and get their 15W/50Whalogen taillight bulbs. They also have 50W backup light bulbs as well. I put these in our Forester, and MAN are those brake lights bright!! Tails are a good bit brighter too. The brightest ones are the 2357s, and they cost the same as the 1157s. The halogen ones I mentioned earlier are about $8.50 each. They are easily over 4x as bright as even the 2357s!!

CONV TOP

I have always zipped mine out and laid it flat in the well before folding. Either the factory book or the installation instructions -- not sure which - -- suggested this. Zipping became difficult as the canvas-like cloth paralleling the zipper aged and stiffened. Also, invisible to me, the zipper pull tended to ride up on the edge of the plastic window, which was a little too close to the zipper for my liking. Eventually the zipper spread enough to where the teeth would hardly mesh anymore -- the zipper pulled apart in the wake. (Later I learned one can lubricate the zipper teeth by rubbing a candle over them.)

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I did lay pieces of felt on both sides of the plastic window before laying it down in the well. This has kept the window clear for the six years it's been on the car. It did not stop a hailstone last week, however. I've not unzipped because I fear zipper-jamming. (No wise-guy remarks!) Somebody else (maybe a couple folks) mentioned paraffin or candle wax (generally paraffin) as a lubricant for the zippers. I think beeswax, if you can find it, is nicer as it is softer and less likely to leave little broken wax chips in the zipper. Beeswax is what the trim shops generally use (I think) so maybe they can get some for you if you can't find it. I almost wonder if the wax "closet ring" for a toilet seal would work well (just please use a new one, cheap Vairist out there. They are really
inexpensive.). That wax is really soft. I have one of these wax ring that I use when driving deck screws into thick pieces of wood with a cordless drill. Just poke the tip of the screws into the wax to apply a little dab prior to driving. Makes the driving MUCH easier. Will it work on a zipper? I dunno.

Spyder Dash Paint Remedy

If you are trying to repaint the inside bevel where the gauges are located, use DupliColor's Low Gloss Black ('Engine Enamel'-you can find it at Wal-Mart or auto parts stores). After looking at as many dash bezels as possible, the color is not a flat black, but does have a very slight sheen to it. The Low Gloss Black matches it perfectly and will freshen up your gauge recesses.

Shifter problems:

I had a car with a problem like this, and a new yoke and pin didn't help. The only thing I could figure out was that the shift tube was twisted. The Tube has a tab bent in to locate into the groove in the yoke. I pushed the tab up so it would not locate in the groove. Manually, from under the car, I put the transmission into reverse. I then positioned the shift lever for reverse, and used two clamps to hold the tube to the yoke. That was 12 years ago, and I haven't missed a shift since.

Shifter modification

1) closely examine transmission mounts - left hand usually fails first - upcoming sale item
2) inspect trans. support to transmission bolts - use Loctite 242 Blue or install studs.
3) rebuild shifter control assembly

Remove tunnel pans, remover shift rod assembly, clean inside and out - remove paper anti rattle liner, acquire 3' of 3/4" copper tubing from hardware store - cut in half - silver solder into shift tube ends = 18" bushings ! (not original type plastic or little brass bushings) lubricate inner shift rod = coat with disc brake grease - water resistant, <u>Order new</u> shift coupler assembly, a coupler pin & hitch pin clip, a coupler boot, a shifter tube boot. Clean, inspect, and lubricate shifter assembly reinstall all and adjust as per shop manual. inspect and consider replacing transmission selector shaft seal ...as it is exposed.

More shifter mods :

I have a slightly different twist on David's excellent suggestion. I use a full length 3/4" copper pipe (the thicker version... most stores will have two available). No solder needed... lightly lubricate and drive it into the tube. Then fit 3 grease fittings on the shift tube and pump in some light lithium grease.

More important is the rear coupler. Beat the end of the shift coupler smaller (those with more skill would weld it up) and drill it out to _exactly_ the same size as the hole in the transmission shaft. Then use a roll pin to couple the two. Even a few thousandths of movement here will translate into big movement at the shifter.

Seth already mentioned the shifter trick... use a '65+ 3sp shifter. The three speed casting (excluding all hardware) is exactly 2.75" tall. The four speed casting is 3/8" shorter at 2.375" - That, by the way is also the distance of the fulcrum move. However, I used a stock '66 Corsa shift with a Clark's quick shift kit. Precise adjustment is _critical_ and reverse will always be a _pain_ to get into... but the shifter feels like a toploader and has less movement than any of my other cars.

More shifter 2

To all: Why don't you just buy the bushing kits from the vendors and make it a simple job. I like the UNDERGROUND kits better because they are easier to install and I think the nylon is probably longer lived than the brass.

You DO NOT reuse the paper tube, just lube up the tube when reassembling. Make sure the tube is straight also!!! As has been mentioned look at the coupler and pin. Don't try to repair a coupler, just buy a new coupler and pin at the same time you buy the bushings.

Shifter adjustments:

I had the same problem in two of my late model cars. I tried installing shift rod bushings, rewelding and redrilling the holes in the shifter fork, and installing new pins in the shifter fork, all of which reduced the problem, but didn't eliminate it. The solution that worked was to remove the shifter fork from the shift tube (the tube that runs from the shift lever, under the car to the transmission). The shift tube has a tang that engages the shift fork to align the fork. Bend the tang so that it no longer engages the shift fork. (This is a good time to replace the shift rod boot.) install the shift fork into the tube, and manually shift the transmission into reverse. Have a helper hold the shifter in the reverse position while you clamp the tube to the fork. I used two clamps because I had them available, but one will probably work. Try the new adjustment before you put the car back down , as you may have to adjust it further.

Corsa Shifter faster

The simple answer is simply that 3speeds got a black shifter and 4speeds got a chrome shifter, regardless of model or engine. The Corsa got a shift tower that had tabs riveted on, which distinguishes them. However, one thing about the Corsa shifter, which you will never find documentation to verify it, is that it IS a quicker shifter. I proved this once when I installed a Corsa shifter in a '69 4speed car. The stock shifter had a long shift pattern in it (almost to the point where you could say that you had to throw it under the dash for first and third and into the back seat for second and fourth - LOL), and it WAS noticably shortened with the Corsa shifter in it - with absolutely NO other changes made! Near as I can figure is that the service part is all the same, hence no documentation. And I have never been able to measure any difference either, so go figure.

Mark Corbin

Reupholstery tips:

Thought I'd provide some thoughts on replacing bucket-seat upholstery and padding ('63 model) since the vendor supplied none: When you replace the foam padding along with the vinyl (I recommend, since the foam is so old), you probably will not need to add any cotton padding except maybe on the flat part of the backrest face and the seat face. The new foam is full enough to fill it out. I would, however, get some burlap to replace the smelly old stuff between the cotton padding and the springs. I know, burlap always smells. But the old stuff is stiff and may not last. Get hog-ring pliers that are stubby enough to let you push the rings in through two layers of stuff. If the hog rings are recessed into the pliers, you will have an extremely difficult -- if not impossible -- time getting them to bite. Put the new wires into the new vinyl the instant you pull them out of the old vinyl. Otherwise it's a puzzle to get them back into the right place. For that purpose, I also suggest doing buckets one at a time, so you have something like a model to work from in the other one. If the wires are rusty, coat them with POR-15 and allow to dry. This will delay your transplanting the wires, of course, but it's better than having rusty parts in there. If the paper wrap comes off the skinny wires, peel it all off and re-wrap them (carefully -- not thickly) with masking tape. Stretch the tape out lengthwise and roll the wire like a cigarette. Wear gloves. Your fingers and knuckles will thank you. Get some high-quality, high-leverage cutting pliers. You'll wear your hands (and patience) out with short or non-sharp ones. Use fresh burlap sacks, cut & sew them to size required. If you have an old mattress lying in disuse, rob the cotton underlayment for your seat upholstery. Reason for burlap and heavy cotton is so the foam rubber won't disintegrate between the seat springs. Burlap holds the cotton in place and cotton protects foam rubber.

Seats:

At 6'4" I too experienced some legroom problems with my 68 Monza Ct. I first bought Clark's seat extender, but still wasn't satisfied with the legroom. A trip to a local junkyard with a tape measure showed that the seats from an Oldsmobile Omega wagon had seat track bolts the EXACT width of my Corvair seat. The distance, front to rear of the bolt spacing was about 1 ½ inches longer than the Corvair seats. I had two 1 1/2 inch by 5 inch, ¼ inch steel plates made and welded to the Corvair seat tracks in the front. After attaching the rear bolts from the track to the Olds seat, I marked the location of the front hole and drilled a large enough hole to accept the bolt, through the fabricated extensions. I now have dual reclining bucket seats, with headrests. The seats are a bit wider than stock Corvair seats, but the doors close nicely, with no problem

This has went around a bit in the last year so I'll be brief . The Dodge Daytona seats are a drop in and almost bolt up for a late vert . I did have a set in mine . I have another set in the shop (rafters) . It has been done by many I have seen 2 other cars besides mine with them . If you need details email me direct ... Also maybe dodge Omni.

After seeing this thread on seats expand, I just wanted to remind anyone thinking of such that there are 4 different Corvair seat bolt patterns ; 62/64, 65/66, and 67/69, all increasingly narrower. 60/61 uses a different set up entirely with clamps rather than a direct bolt in at the front. SO.....what worked in one Corvair will not necessarily "bolt in" to another. Moral- bring your tape measure and specs when seat shopping

Pontiac GrandAm seats front/rear fit well in an early coupe. One of our club members has done this. According to him the back seats fit nicely

Most GM mid to small car buckets will fit without to much modification. They usually have better adjustments fore and aft and recline, plus sit lower to the floor. Take a look at mid to late 90's Ford Escort buckets. I have a set in my '65 4-door. The fronts just about bolt right in (just bend the brackets on the Escort seats and cut off an aligning pin. The holes line right up and bolt into the Corvair. Good position - the rear mounts have to be fabricated / welded / bolted - but at least the front mounts are in the right place. Also 95 Monte Carlo seats close fit in lates.

LM 'vert rear seat :

Came across an interesting and useful part substitution. LM Convertible rear seat bottoms are hard to come by. I met a gent this morning who used a rear seat bottom out of a 89 Chevy Cavalier. Apparently is was a perfect fit, and it even took new 'Vair skins to boot. He only had to drill two new holes to hold down the front of the seat. This rear seat came out of a 89 Chevy Cavalier 2 door with the fixed rear seat(he thinks there is a folding rear seat option?). It is entirely possible that other models used the same rear seat bottom, however this was the first one he found that worked and didn't measure any further.

Subject: RE: Seats

I finally got myself in gear and bought some replacement seats for my coupe. I lucked out and found some nice (no rips, very little visible wear) 1987 Nissan Stanza buckets (cloth, kind of a velour). They are "Recaro- like"--nice side bolsters. They almost bolted right in--just removed the Nissan seat tracks and bolted the Corvair tracks on instead (had to elongate a couple of the holes, etc.).

Seat swap

A club member here put seats from a '94 Honda Accord into a '62 Monza. He says the dimensions are perfect and they bolt right in. The fit of the rear seat could not have been better. Personally, I prefer original seats but these looked very nice and tasteful. What's even better is that he only paid $40 for the set

More on seats:

I just installed a set of seats in my 66 convert. They are out of a 99 Dodge Stratus. It took a far amount of work, but they look and feel great. I was also able to use the back seat out of the Stratus, so it all matches.

Tachometer Check

These tachs have a habit of cracking the copper on the PC board next to the studs that mount it to the IP case. Bridging the crack with solder will fix this. I had two with this problem!

POWER WINDOWS

Here's the scoop on the power windows. I have not completed installation at this time, I have done a mock-up, and it appears to be workable, as long as you don't mind deviating from the stock interior (i.e. door panels). I ordered a set of (4) window crank motors from J. C. Whitney. I then removed the plastic case revealing a fairly compact motor which will be bolted to the inside of the door panel (visible). I then fabricated a fiberglass cover which will fit over the motor (look at the door panel on a 92 - 96 Ford Truck for the general shape) and will also hold the tweeters for my stereo system (located where the window/door lock controls are on the Ford Truck). I will also relocate the switches to the center console and eliminate the extra two switches. Look through the junkyard for good quality power window switches to suit your style. It works on the mock-up, but I have not put the weight of the glass on the motors yet, so I hope they will indeed lift it. As for the center console, it probably won't be of help for anyone, I'm using Peugeot 505 bucket seats and they're quite a bit wider than Corvair seats. But it is all cardboard pattern, fit,

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trim, fit, trace to steel, cut, fit....... you get my drift. Lots of PATIENCE! When it's done, it will have a naugahyde (poor naugies) cover on the sides and walnut top (very narrow). The power window kit I am using is the $79 set from J. C. Whitney. It will only mount on the inside of your door panel (within plain sight) where your window cranks are located. I have fabricated some fiberglass covers (much smaller than the ones supplied) and relocated the rocker switches to the center console. I have only done this in a mock up situation, and I assume the motors have enough strength to put the windows up. I am trying to get the car painted this winter, and will probably finish the install some time this summer. I will keep everyone updated on how it works. BTW, avoid the aftermarket kits for the street rods. They are designed for flat glass and will not work well (if at all) with the curved late model glass. Hope this helped.

More on power windows :

The late Corvair was engineered to use the same power windows as any other GM car of the 1959-'76 era. If you take the window regulators out, and compare them to power window regulators from another GM car you'll see right away how to adapt the power windows. Its a big job but very easy to do. The power window switches and harnesses for any Chevrolet model from 1961-1972 will be the right style. GM made them easy to install, as they probably were considering offering it one day as an option, the 1965-1969 heating and A/C system was laid out to permit automatic temperature control as well, and most other Caprice type options had provisions made for them.

Sticking jammed doors

You need one strong person on the outside of the door and another on the inside. Roll the window down so the outside person can get a good grip with at least one hand because he is also pushing in on the button. Next with the two of you in rhythm, jerk on the door on the outside while pushing violently with your shoulder on the inside. It WILL come open, just a matter of time. After you clear the piece of nylon the latch will be good as new in most cases The fix for me was to lower the window, rap a piece of 2x4 about 24 inches long in a blanket or towel, place it against the top edge of the door on the inside, lie down on the seat and push against it with my feet while some depresses the handle release on the out side and pulls the handle as hard as they can. This will usually break the piece of plastic and it will fall out of the mechanism. Then the latch will work OK again. If you don't use the wood rapped in a towel you will dent the door top edge with your feet

Convert to power top :

1. Relay
2. Two side gears (only)
3. Motor & gearbox combo.
4. Wiring harness from Clarks or Walls
5. Under dash switch with housing and bracket. Don't forget the bracket!
6. Harness from switch to power.
7. Two short speedo looking cables (probably green) from motor to side gears.

Why not to use power top :

It's really cool to put your top down with a single button push, but it's murder on the top and the back window. Really beats the living snot out of them after a while On my manual-topped Corsa convertible, I pop the front latches to relieve tension, then unzip the back window, lowering it neatly into the well (no creases!), then get out of the car and fold the top back by hand. I go back and forth right to left to make sure the thing folds the way _I_ want it to. To secure the top down, pull the top catches (what's their real name?) inward as you're pushing the top down; don't just push the top down into them or the plastic "ears" will eventually break off. All in all, power tops are beat. Just one (actually MANY) more things to break.

Convex mirror for Corvair:

Someone posted that the convex mirror for a Dodge Aspen was the same 4.25" size as the Corvair mirror. Just go to your local glass place and ask for a 4.25" diameter convex mirror for a '76 to '80 Dodge Aspen. Just take out the snap ring and flat mirror and replace it with the convex mirror. The snap ring holds it in place, just like before.

Sport steering wheel for late model:

The Corvair "Sport" Steering Wheel option , along with the Telescoping column option from 1965-66, use a wheel drilled with a six hole on 3" circle pattern. The Sport Wheel option has the wheel riveted in place, the tele-wheel uses screws. Both of the hubs are specially drilled for these wheels. The wheels are designed so that, when installed, there are two attaching bolt holes at the top (each 30 degrees off of vertical), two in the middle (90 degrees off of vertical), and two at the bottom(150 from vertical). There are aftermarket wheels which will fit these adapters, notably from MOMO wheels. (Momo on left, Chevy on right)

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They use the same bolt pattern, six holes on a 3 inch circle. The MOMO wheel is designed so that, when installed, one hole is at the top (zero degrees off vertical) two holes at 60 degrees off, two more at 120 degrees off and one at the bottom, 180 degrees off. In other words the bolt pattern is rotated 30 degrees from the Chevy. I have run these wheels for many years, I must have five or six of them. If you just bolt them on and align the wheel/hub assembly so the spokes line up straight, the canceling cam is now 30 degrees off it's intended position. There are four possible solutions. #1 redrill the back of the hub so the cam mounts in the (relatively) same position. (A problem with this solution is the horn button pass through depends on the position of this cam for clearance, you might have to redrill the cam to clear the button contact.) #2 add another adapter to the top, rotating the wheel another 30 degrees. #3 align the hub to the correct position and live with the wheel being 30 degrees off. #4 Grant and maybe others make wheels which are drilled to mimic the Chevy pattern. They are intended for Corvettes of the same era, but fit the Vair fine.

Steering wheel hub: The 65-66 Sport Wheel option used a hub unique to that model. (the 64 wood wheel option used a one-year-only hub with the same spline. The tele-column used a standard GM big-car spline, as did all 67-up Corvairs. No Momo hub was ever made for the 65-66. You could try a Clarks wheel adapter to get to the standard 3-wheel flange, then an adapter from that to the wheel of choice.

Reply : As I recall the Corvair steering box is set up so that the gear teeth are tightest in the "straight ahead" or centered position. If you compensate for an improperly mounted steering wheel by offsetting your tie rods the steering box will not be centered. You will then notice a definite looseness when driving which you cannot take out by tightening up the box lash. If you do this then the box will bind when it passes through the center position. Try it for yourself. Center the box and set the lash. (This is the screw accessible through the trunk.) Now turn the wheel right or left a half turn or so. Try to reset the lash and it will be loose again. If you were to now try to recenter the box now you would find that it either binds or that it puts brutal internal stresses on the bearings and bushings. (The case where this does not hold of course is when your box is badly worn which is always the worst in the centered position.)

Make sure you back off the lash adjustment after this experiment and reset it properly with the box centered. There is no self centering feature in any Corvair steering box. The return of the steering to center is strictly a result of front wheel caster adjustment. The steering box should always be centered when the car is going straight, as the box has the least amount of play at center. because of this, the lash adjustment must be only be made with the box centered.

Gauges for Corsa dash:

On the Corsa dash that I converted for my 4.3 Vair I used gauges from an '80 Chevy fullsize pickup. They have faces similar to the Corsa's and I added a stainless nub on the center of the needle to match the "stock" needles. I used the voltmeter, oil pressure and temp gauges. On a stock/non-turbo engined Vair the voltmeter and oil pressure would be give more useful info (IMHO) than the clock and vacuum gauges.

PAINT

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Gas proof paint

I have found 2 spray paints that have remained behind after gas and engine cleaner application. 1 is dupli-color engine enamel with ceramic and a 500 degree temp rating. the other is Plasti-Kote 500 degree engine enamel. Both come in a variety of colors, including "Low-Gloss Black" which is a pretty good match for shroud black. I used it on several shrouds and so far, it has been behaving itself. Everything else I've tried comes right off or shows runs wherever a chemical has dripped on it.

PAINT:

The ONLY reason to use lacquer these days, would be to duplicate the factory finish. There are no advantages (other than cost; did I open up another sore?). Base coat, clear coat is so much better! I like PPG Deltron line of paints, though other name brands are good. Base coat/clear coat is definitely the way to fly. Most of the paint thickness isn't pigmented, which gives a lovely deep gloss, and you can polish the hell out of it before you hit the color. I would definitely go with POR 15. And hit EVERYTHING that isn't cosmetic with it. Get one of those cheap pump up garden sprayers, and get POR 15 inside the fenders, doors, windshield and rear window headers, etc. Of course, prep everything first. POR's website has all the info on how to do this. Last choice would be enamel. It will go over the old finish (if you seal it)but it looks, well like enamel. If you seal and use enamel and later change your mind it is a bear to get off.

Paint info:

Overview of DuPont products:
(very rough from memory - might have some inaccuracies, so please correct if I goof up)
**Lucite = Acylic Laquer. lots work, many coats, buff buff, buff. Cartridge mask OK. Can be fixed "easily" if you screw up. Lousy durability for street car. Cheap
**Centari (plain) = Acrylic enamel. Less work, takes forever to dry, unforgiving with painting errors, more durable, doesn't look as nice as a good lacquer job. Cartridge mask OK when no iso additives used. Cheap.
**Centari + Hardener = uses isocynate hardener to speed paint dry, make it more tough, and much better gloss. Used to be paint of choice for most street drivers. Isocynates are little molecules that go right through cartridge masks & build up in you. Med. priced (the hardener is fairly expensive).
**Centari+2000 power pack = essentially makes Centari into a urethane. Quicker throughput for repair shops, easier to do repair work, good durability & gloss. DuPont came out with this to extend the life of their Centari product line. A bit old-tech. Also has isocyantes. (med-high priced)
**Base / Clear (I forget the product name). Very easy to shoot b/c the color coat goes on easy & dries fast (like primer). The care occurs when the clear (which is urethane) is shot on top. Pretty quick drying. Separating color & the gloss functions makes it easier to shoot (at least for me). The clear has those nasty isocynates. Real flexible & durable. I

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used this to paint my motorcycle & came out great. Lots of gloss. (high priced)
**Imron: A polyurethane that looks / holds up great. Fume-wise, probably the worst of them all. Also probably costs the most. I think it is generally used as a single coat system (not base / clear). (most expensive)

Other notes:
1. All professional bodyshops are weasels. (somebody please tell me I'm wrong) They love to cut corners and hide things. If they say they are cutting a panel out & replacing it, tell them that you want the old piece. Let them know that you will be stopping by EVERY day to take pictures for "your restoration story book" (or whatever). This way you can be sure it really got fully stripped & patches were properly welded in, etc. If they don't like this, find another place.
2. Be extremely specific about what parts you want what color. Give the guy a written picture map (cove silver, lower grill body color, etc.)
3. Request that they get enough paint to give you a pt. or so. Even if you use a factory color, mixes don't always turn out exactly the same.
4. If you can, strip the car as much as possible for them. (trim, bumpers, etc). It will save you $$$ and keep them from getting lazy and tape-masking the parts (a definite no-no). Door edge guards, tank guards, emblems definitely come off.
5. You may wish to remove the carpet. Paint dust gets EVERYWHERE & can be really hard to get out.
6. If the car is a convertible, stress that you will tolerate no (zero, zed, zilch, nuttin') overspray on the top or rear window. It is a MAJOR paint in the ass to get this out of the top grain if the car wasn't masked properly.
7. If you want any screw holes (old mirrors, etc.) filled, map out exactly which ones get filled, and which holes stay there (for emblems). My Corsa has only one "C" on it because the nimrod who painted it 12 years ago forgot which holes to leave. Yeah, I could redrill them, but it's not high on the list of priorities right now.
8. Look at some other work the guy has done. Check out finished cars at the shop.
9. If there are dents / rust, let him know that you will tolerate no more than 1/8" of Bondo for surfacing. When you show him your car, bring a magnet & point out "what some previous idiot had done" or tell a story about how hard it is to find a place that won't put the filler on with a shovel. Be very clear about this & get some sort of specification on the contract.
10. Write out a contract ahead of time and make him sign it.
11. A good paint job is not cheap.
12. Body work is even more expensive. If the guy does a good job, the $1700 is well justified. If he sucks, you could have taken it to Maaco & at least got what you paid for.
13. When the car is done, keep it off salted roads at all costs. Not even "just once". Salt gets into every little nook, cranny, crack, and imperfection, and will quickly wreck even a decent car. It is truly amazing how much longer a paint job will look great (and the car survives) if it's kept out of salt. Having a garage is important, but no salt is CRITICAL.

Current paint tech:

ASSUMING YOU HAVE THE PROPER SAFETY EQUIPMENT,
a polyurethane (such as Imron) or a Urethane base coat / clear coat (such as DuPont's Chroma Base / Chroma Clear) is the way to go. I've never tried Imron, but I have done Chroma Base / Chroma Clear and I would NEVER go back to catalyzed enamel. Lacquer is not a viable choice for a car which is driven.

2. I'm sold on PPG's two part (base/ clear) system using Deltron as the base and Systems 2000 as the clear. Goes on easy and dries fairly fast. Nice shine. I've used Imron also; great paint, but takes awhile to dry. Boss shine.

Corsa dash paint

I could recommend using a wrinkle-finish black paint. It's actually a semigloss, so it's real close to the original color and texture. I would suggest using a REAL good high-zinc primer, after masking off the rims around the gauges. The Vari-Prime I use on bare metal works well on aluminum, too, and because of the epoxy-based nature of the paint itself, it seals the dash very nicely. The wrinkle-finish paint makes it look real close to stock.

Wrinkle paint (problems) :

I had the same problem using the wrinkle paints I got at the hardware store and from one of the Corvair vendors. If I put the paint on heavy enough to wrinkle then it would run. If I didn't put it on heavy, it wouldn't wrinkle evenly. I followed the directions carefully and when that didn't work I experimented with heating, again to no avail. I finally ordered wrinkle paint from Eastwood. It came out great the first time.

Engine compartment color: Dupli-Color "Engine Paint" part # DE1634 or 91634 - name is Low GlossBlack. This may not be the exact color, but is sooo close and so convenient. Spray cans, covers well. I get it at TRAK Auto. I'm sure other chains have or can get it. I've also used (lower shrouds) "High Heat" part # DH1602 or 34602. Have only used that under the engine (where most folks are not even going to look). It is more flat than Low Gloss and does not exactly match it. Probably don't really need it, but was experimenting at the time. 2) I use semi gloss and satin and gloss accordingly . It is Rust - Not by Plasti - Coat . available at Discount Auto Parts (locally) at3 dollar or so a can . It is not the cheap stuff and holds up very well and doesn't fish eye or react to any thing underneath ,and dries fairly fast .NOH20CURT

Interior Paint:

The interior metal color (inside of the doors and below rear glass) is a semi-gloss interior black in your case. The best rattle can match I found was a semi-gloss enamel from Duplicolor. Also a friend of mine painted his black with Krylon Semi flat black, and it turned out pretty darn nice. Since you are going the extra mile and doing a ground-up, I'm sure there are others on the list who have the exact match mix numbers you can get from an auto paint distributor or retailer**.** "stock" interior color is 60 gloss rather than full gloss as would be used on the exterior, and you won't clear coat it. So you will need a different type of paint. Dash should be flat black. For the interior get yourself a pint of quality no-clearcoat-necessary paint of your choice (something like Dupont Centari) in 60 gloss and spray with a touchup gun. I think you would have trouble getting adequate results with a spray can. You can use a spray can of flat for the dash since the flat black goes on very easily. You can also use the 60 gloss for shrouds, suspension parts, and all the other tons of stuff that needs to be semi gloss black so you may want to consider a

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quart. Sherwin-Williams makes a paint specifically for interiors called "Ultra Interior"; I used it on my Spyder with good results - went on soooooo easily in a semigloss slightly metallic aqua.

Powder coat:

Just about any paint I've used was stripped by gasoline. My recommendation is to have ALL the shroud sheet metal powder coated. This stuff is amazing, its unfazed by hot gas, is chip resistant, acid resistant, and looks good as well! Also since it is bonded to the metal the chances that it will wear off and allow the shrouds to rust is reduced. It can be a little more expensive than just paint as you must clean and sandblast the parts before powder coating them. I had my sheet metal done in gloss black, though satin may be more "stock" in appearance. There are other colors available as well, the shop I went to had a neat looking "cast iron" coating that might look interesting. Either way the engine shroud will look really sharp! 40 black is a pretty good match for original. Powder coat is almost indestructable and less expensive than a lot of paints.

Powdercoat testimonial :

I build about 12 Corvair engines a year and I wouldn't paint any of the sheet metal. I get everything powder coated. I looks great and stands up to heat much better that any paint (other than ceramic paint). It is not effected by battery acid, alcohol, gasoline, carb cleaner, or gunk. It can only be damaged by physical abuse. If you drag your bottom on high crown roads you will scratch & chip it. If you dig a screwdriver into it or bang it hard with a hammer or wrench you can chip it so if you are a hammer hand mech.
don't use it. Nothing holds up as good as powder coat and nothing rusts under it. The one thing you can not do with powder coat in clean it by dipping it in carb cleaner. It will cause it to wrinkle. Here in So. Calif it costs about $150.00 to do all engine sheetmetal and pulleys, including rocker covers and cylinder baffles. That includes hot tank cleaning and sand blast. Caution, do not powder coat or paint any of the aluminum parts as it
will cause it to hold in the engine heat.

Shroud paint:

I have been using/selling Krylon semi-flat black paint for many years..it is their number 1613..all of my show cars have had the engine compartment and underside painted with this paint..the judges sure like it as I have won many best engine/undercarriage awards

I've gotten the best finish out of the quart cans of black "shroud paint" that Clark's sells. Load it in a spray gun and away you go. They sell the same thing in spray cans but the finish is not as nice; no surprise there. **2**. On spillage of gas on Krylon will ruin the paint. I use Plasticote engine enamel (same colors). It will not rub off after gas has hit it. In fact in my search for a good shroud paint I actually would paint a piece of sheet metal and then (after drying of course) soak a rag in gas and rub the painted sheet metal. Unless it was an actual engine enamel, the gas would wipe the paint right off. Just my .02 cents worth. *Steve Goodman*

Paint suggestions:

I can say that using a good catalyzed polyurethane enamel (duPont Chroma, PPG, or any top-shelf paint,) will GREATLY increase your paint's useable lifetime. If the car has been painted twice (original plus one repaint), it would be best for the durability of the next paint job if the original paint was removed to metal by means of media blasting. Using plastic beads or (media) or bicarbonate of soda as the stripping media offers a great improvement over sandblasting. Soda/media blasting will remove the paint, but won't touch the original phosphate coating on the original steel. That gives you some time (not weeks!) to address any small rust spots on the surface. Believe me, you WILL find minor rusting in the strangest places when all the paint is gone...

After you've addressed surface rust, mask off any rust that has corroded into the steel, and shoot the whole car with a high-zinc, self-etching epoxy primer. I've had excellent results with duPont's Vari-Prime, but I'm sure there are comparable primers available from the other companies as well. After that primer dries, repair any corrosion with sheet metal parts welded into place, then prime the new metal.

I use a "high-solids" sanding primer, like Herbert's Stand-Ox. Lay it on heavy, and DRY-block it. If you find minor ripples on an outside panel, or on the dashboard, use Metal-2-Metal filler after dollying the majority of the ripple into line. I suggest M-2-M because it reacts to heat and cold as close to the original body lead as can be found. The
all-plastic fillers expand and contract at different rates than steel, while the M-2-M is very close. A second heavy sanding coat and dry blocking should have you about ready to do the sealer coat.

The sealer coat is usually another layer of sanding primer mixed with some of the finish color (maybe 10% finish color into the primer). Mix enough to shoot the whole car, and DO NOT sand again. Wait an hour or so, then start shooting the color coats. A decent first coat, maybe an hour's wait, then a heavy (non-running) second coat. DO NOT WET SAND the color coats. After the appropriate delay, start shooting the clearcoat. After you finish two or three coats, let the car sit and cure the paint for at LEAST 24 hours, though 48 would let it get harder. After the clearcoat has cured, you can wet sand the clearcoat if you see irregularities. Start with 1200-grit, a 3M sanding block, and a bucket of clear water. Further dressing can be done with 1500 and 2000-grit papers. Then you get a variable speed buffer with a pad the size of Nebraska, a bottle of Meguiar's polishing compounds, and go to town. If you are referring to the metallic beige that was used on the earlies, I would STRONGLY recommend the two-stage method. You WILL pay more for the materials, and more time in the paint booth, but will be well worth the extra time and expense in the long run.

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SUSPENSION

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Lubing Steering Gear Box

I still maintain (despite Ken Hand and the Lates Shop Manual) that chassis grease is NOT appropriate for the steering gear box. That grease channels, pockets and just doesn't flow. What is needed is a low viscosity lube that flows into and with the balls and ballnut. Grease just doesn't do the job IMHO no matter how it is inserted into the gear box. Now that mix of 50-50 grease and diff lube, that's another matter and works pretty well. FYI, I tried the Zerk fitting technique back in the 1960's!!! And discontinued using straight grease after I took a steering box apart and saw the grease packed inside everywhere except on the moving parts. That is when I stopped using chassis grease. Also back in the long gone '60's when steering gear lube was available, I had some and it was like mush....that is, capable of FLOWING. Grease isn't and doesn't. So sorry, but grease is no good in my mind, no matter how it's placed in the steering box.

More on Corvair steering box lube

You'll get many opinions on this one. The debate is what to put in the steering gear box. The Early shop manual refer to steering gear lube. Try to find anything like that in this age of power steering. The Late shop manual says to add chassis grease. But there are problems with using chassis grease. Such as how to get it in. Then the fact that it doesn't flow. It channels and pockets. So it really isn't a good lube for the gear box. But it generally doesn't leak out. Something more fluid tends to leak out of the gear box. So there you have it. Some people recommend a mixture of chassis grease and differential lube...50-50. Heated and mixed before it is installed. Take it from here.

Lube Fitting/Steering Box

I have not before responded to this debate because everyone has they're own opinion. Some say mix STP and grease, some say mix 80w90 gear lube, and with these, the people also say, that they some times have a drip from the steering box because the seal on the pitman shaft doesn't seal prefect. Well I quote from the GM chassis manual, "The manual steering gear is filled with a water resistant grease. Seasonal change of this lubricant is unnecessary and the housing should not be drained. The steering gear lubricant level should be checked every 36,000 miles. Whenever required, additions should be made using a water resistant EP chassis lubricant.

Check and fill steering gear as follows:

1. Remove filler plug on forward part of housing.
2. Insert filling device in hole.
3. Inject lubricant until it appears in hole; gear is now filled to correct level.

The steering linkage should be lubricated with water resistant EP chassis lubricant every 6,000 miles or six months, whichever comes first. lubrication points and additional information can be found in Section 0 -- General Information and Lubrication." end of quote.<> This is from the 1967 chassis service manual.

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On a personal note and in keeping with what is called out in the service manual I use the Amsoil synthetic grease. You can use any grease that conforms to the EP water resistant type as long as it is a soft buttery consistency. I prefer the synthetic because it has a better EP (extreme pressure) grade and a better temperature range. I hope this helps everyone out there.

Steering Box Adjusting

This is from the 1965 Shop Manual and is easier than the 1961.

Before attempting steering gear adjustments in an attempt to correct such conditions as shimmy, loose or hard steering, or road shocks, make a careful check of front end alignment, shock absorbers, wheel balance and tire pressure for possible causes.

Correct adjustment of the steering gear is very important. Only two adjustments are possible but they must be made in the following manner, step by step, in the order given. The lash adjusting screw is accessible through the trunk compartment floor pan plug.

1. Remove pitman arm nut and lock washer and, using Tool J-6627, pull pitman arm from pitman shaft .

2. Loosen pitman shaft lash adjuster screw lockout (fig. 4) and turn the lash adjuster screw a few turns counter-clockwise to remove overcenter load (increase lash). **Gently** turn the wheel in one direction until stopped by gear and then back off one turn of the steering wheel.

CAUTION: Do not turn the wheel hard against the stops when the pitman arm is disconnected since this may damage the ball guides.

3. Pry off the horn button. Using a suitable size socket and a low reading (in. Lbs.) torque wrench on the steering shaft nut, measure the torque needed to keep the wheel in motion. This should be between 3-1/2 and 4-1/2 in. Lbs. If the torque does not fall within these limits, adjustment of the worm bearing is necessary.

4. To adjust the worm bearings (See Fig. 1): loosen the worm bearing adjuster locknut and turn worm bearing adjuster down until there is no perceptible end play in worm. Check the pull at the torque wrench, readjusting the adjuster nut as necessary to obtain proper pull. Tighten the locknut and recheck pull. If the gear feels "lumpy" after worm bearing adjustment, the bearings are probably damaged and the gear should be removed and disassembled for replacement of the damaged parts. See "Service Operations".

5. After proper worm adjustment is obtained, and all mounting bolts are securely tightened, adjust the lash adjuster screw (fig. 4). First turn the steering wheel gently from one stop all the way to the other, counting the total number of turns. Then turn the wheel back exactly half way to the center position. The mark on the steering shaft should be at the 12 o'clock position. Turn the lash adjuster screw clockwise to take out all lash in the gear teeth, then tighten the locknut. Check the highest torque needed to turn the wheel through the center position (fig. 5). Torque should be between 8 and 10 in. Lbs. in excess of worm bearing preload, but not more than a total of 14 in. Lbs. Readjust if necessary to obtain proper pull.

6. Tighten locknut and recheck. Torque must lie between the specified limits.

NOTE: Always make the final lash adjustment in the clockwise direction.

7. Reassemble pitman arm to pitman shaft, first making sure that wheels are straight ahead and that the steering wheel and gear are .

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Greasing Steering Gear Box

Water proof pump grease, like the kind used for pool pumps and valves, works great on steering boxes. It doesn't flow well, but it is so sticky that it re-strings itself all over the moving parts. I have done many a leaky VW steering box that way and it works.

I just surveyed several oil company web sites to see what products might work for steering gear lube. The Exxon-Mobil site had the best information and specifications for a variety of industrial gear lubes in a range of viscosities. In particular, one product, Mobilgear SHC® 1000, 1500, 3200 and 6800 was recommended for low speed, heavily loaded, enclosed gear boxes (a steering gear) and could be used to replace grease in some applications. I believe that the product numbers approximate the viscosity grades of these lubricants--which would be about halfway between grease and oil. BTW, this is a synthetic base lubricant.

Greasing Steering Gear Box

With all of this talk about what to put in the steering gear box, why not use Genuine GM steering gear lube. It comes in a 10 oz tube, is labeled Goodwrench Steering Gear Lubricant and has the part number #1052182 (group 8.800). It took about 3 tubes to fill a freshly rebuilt (dry) 58 GMC steering gear (the GM dealer I ordered it from said they can only get them in packages of 4). The lube looks like a mixture of 90 wt and grease, however it doesn't seem to separate (which is good if you don't drive your vehicle too much). The tube has the list of ingredients on it if you need to know the technicals

Old Grease (the enemy):

There's a lot of talk about adding zerks to wheel bearings, greasing steering boxes etc. Remember that simply pumping in grease is no solution because :

1) Contamination and separation of old grease is the #1 enemy. Simply adding more grease does nothing to solve this problem - in fact it can make things worse by forcing contaminated/separated (old) grease into critical bearing areas

2) Filling a cavity with loads of grease is NOT professional (recommended) practice. Grease should only be in the immediate working areas and no more than that. The reason is because grease that is never used separates and some types can actually attract moisture (when not being 'worked") There are other reasons too.

3) As Bob Helt pointed out, unless there is a way for air and or excessive grease to exit elsewhere your grease gun is a very efficient hydraulic pump and can blow out seals. Each cubic inch of grease must displace a cubic inch of something. I believe these components didn't have grease fittings because, you will notice where grease fittings are used, you don't have critical seals.

Crown Strut bracket:

The Crown bracket wasn't flawed when designed and built in the late 1960s. The intent was to maintain a flat contact patch on the outside wheel with the wide bias-ply tires of the era. Also it was intended to be used with a lowered, very stiff, roll-controlled (via Crown bars!) suspension, and major league static negative camber. What has obsoleted that design is the change in tire technology. Today's tires, especially the street radials that most people run, do not need that amount of negative camber to be effective. Three degrees of negative camber, with the higher pressures of today’s radials, will cause a smaller contact patch on the rear, not the hot set-up. If you set a Crown bracket equipped car at a street ride height, and small, say 1 degree negative, static camber, when the suspension travels through its curve in "enthusiastic" driving - the camber change due to body roll and suspension compliance can cause positive camber and strange contact patches. The relocation of the mounting hole back up towards the original point will regain most of the original camber pattern change. This is all "in my opinion" and yours may vary, etc. PS - The Crown bracket makes a very effective

Rear grease fitting

And now for equal time to hear the other side. Everyone is certainly entitled to his opinion, and his way of doing things. But there are reasons NOT to install a grease fitting for the rear wheel bearings on late model Corvairs. Read and decide for yourself. The idea sounds good! That is to ensure that the rear wheel bearings get some needed grease so that they don't run dry. And it sure IS expensive and/or time consuming to replace those

wheel bearings. But here's the other side:

That cavity inside the rear wheel bearing hub is **HUGE**. I mean **HUGE**. And you have to fill it with grease to get any over to the wheel bearings. With my large hand operated grease gun (and it was working correctly) using the standard size grease containers, it took 55 (THAT'S FIFTY-FIVE) full pumps of the arm to get grease over to one of the bearings. How do you know how much grease is enough? Well you pump until it starts to show at the bearing seal. Then that's too much! For it will forever release excess grease past that seal. And some of the grease will get all over the inside of the drum. Some might even get on the brake linings. So then you can look forward to doing a brake job later. Of course you can spend every Saturday removing the brake drum and cleaning off the grease that is seeping past the seal. That is, if you like that sort of thing.

And what about the bearing on the other side? Did it ever get any grease? Or did all that grease just go to the one bearing? You'll never know unless you pump some more grease into that cavity! The whole operation is extremely uncontrolled and messy. Why overload one bearing and supply no grease to the other bearing? I recommend that you NOT install a grease fitting. Just use the proper amount of synthetic grease when you rebuild or replace rear wheel bearings, and you should go trouble-free for a long time. Beware that the amount of grease needed to keep the wheel bearings is very small. if you add 1/2 strokes per a grease gun should be more than enough per year. anymore and you'll get to redo the brakes and etc. put them on mine 11 years ago because of the tech guide but not so sure anymore. if the original amount of grease lasted for 30 years why bother

LM Rear wheel bearings:

What's wrong with deleting the "press fit" as some have done? Bob sez: If you delete the press fit, be sure to adhere to the 100 ft lbs torque on the spindle nut, or it will spin the bearing. Been there.

Rear wheel hubs

Two points on the rear wheel hubs from an Ultra point of view.

Point 1. The rear hubs get hot and if they are filled to the brim with enough grease to come through the seals when cold, guess what will happen when the hub gets warm? We run our Ultra an average of 15,000 miles a year (since 1987) and there is no way I want any grease to get onto the brake shoes, so for me, a yearly disassembly, inspection and re-greasing is well worth the day it takes to do the job.

Point 2. We have to ensure that the rear hubs can be replaced on the side of the road, but this does not mean the interference bearing fit has to be eliminated. The original

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Ultra Van manual suggested removing material from the spindle, but in practice I now only very slightly polish the spindle where the inner bearing rests. With the proper "J" tools, the yoke and spindle can be disassembled by the side of the road. Like Steve and Bob say, the whole stack must be held tight, so I always use a new nut and torque to the next cotter pin hole after 100 foot pounds.

Revised wheel Alignment

Alignment specifications for use with radial tires. The following revisions were generally suggested by those who responded:

1) Increase front caster to 4.5-6 deg. This seems to follow and extend beyond the factory revision in 1966 which increased camber from 2 deg to 3 deg. I understand that the more flexible side walls of radial tires (compared to bias ply) transmit less resistance back through the steering gear for a given deflection, so this change will add more "centering" force to the steering and compensate for the lesser force from radial tires. I would also expect that tire width and aspect ratio would factor to some degree, so that wide low profile tires on 14" or 15" wheels should be set up with greater caster angle. (I am not a vehicle dynamist. please correct me if I'm wrong.)

2) Shift to more negative front camber. The factory specified 1 deg positive camber for both '65 and '66-9 but the respondents suggestions were for 0-1 deg negative camber.

3) Decrease front toe-in to 1/8" +/- 1/16". The factory recommended 1/4" to 3/8" in 1965 then backed down to 1/4" for 1966. This would follow the increase in caster, which increases directional stability, thus reducing the need for toe-in.

4) Shift to more negative rear camber. Interestingly, the factory recommended 0-1 deg negative camber for 1965, then changed to 1 deg positive camber for 1966. The group suggestions were for 1-1/4" +/- 1/4" negative camber--approximately the same as the original '65 factory specification. I assume that the factory change was made in response to field reports of tire wear. Since radial tires seem to be less sensitive to wear due to alignment, it would be reasonable to return to the '65 specification of negative rear camber.

5) Leave rear toe-in at 1/4". The factory recommended 1/4" toe-in for both '65 and '66-69. The group suggestions were about the same. In summary, I propose the following specifications, which are a compromise between the factory recommendations and the more performance oriented respondents' suggestions. I will try them out on my wife's 65 Monza, which has stock suspension, but is equipped with 14" wheels and 195/70R14 tires:

FRONT
Caster 4-1/2 deg +/- 1/2 deg*
Camber 0 deg +/- 1/2 deg*
Toe-in 1/8" +/- 1/16"
*within 1/2 deg of opposite side

REAR
Camber -1 deg +/- 1/2 deg*
Toe-in 1/4" +/- 1/16"
*within 1/2 deg of opposite side

Wheel Alignment for late

If you drive on the highway a lot, you will want to run extra caster in the front. I find that 4 deg for quick steering boxes and 5 degrees for normal is right. It does make the car harder to turn at low speeds, but really makes it point well on the highway especially in crosswinds. The Fitch sprints came with 4.5 degrees. The same with caster in the rear. The more negative (within reason) you go the worse the tire wear but the better the car feels. I run about 1 to 1.25 degrees negative.

Identify slack in front suspension:

The pittman arm bushing (actually relay rod bushing), which you have replaced, is the biggest contributor. The steering gear box adjustment is probably the next big one, especially in terms of bang for the buck(adjustment is likely to take a lot of slack out with no parts cost).Follow the service manual and tech guide. After that I don't know if there are any generalities. I suggest you do the diagnostics in the tech guide to determine where your slack is (my next area was wheel bearings) and attack that.

Steering box rebuild

I'm working through the steering gearbox on my '65. Here's a couple of things I found to make disassembly easier:

1) Removing pitman arm. Most pullers I've seen are slightly too big to pull the Corvair arm; the one I had would slip off at an angle. To correct:

* get two grade 8 7/8" washers.
* cut a sector out of each so you end up with two C shapes.
* put the two washers around the pitman shaft from opposite sides so that the closed section of one overlaps the open section of the other. You end up with a metal ring of washers around the shaft in behind the arm.
* You can now use the puller to pull the washers; they are slightly larger than the arm and have square edges so the puller won't slip off.

2) Removing cover bushing. You can use the grease trick for this, like a clutch pilot bushing.

* Turn the adjusting screw around backwards and screw in to the cover from the outside, to fill the hole. Careful, don't put it in past the inside end of the hole, or you'll damage the end of the pitman shaft later!
* pack the hole with grease
* put the pitman shaft into the bushing
* whack the end of the shaft gently with a hammer and block of wood. This will pop the bushing up about 3/16" or so.
* Once the bushing is popped up, I was able to just grab with pliers and pull it out easily. If it doesn't come out, remove pitman shaft, pack with more grease, and tap again.

Lube steering box :

Mix 90wt gear oil and Moly grease about 50/50, erring on the side of more oil. Heat this mix up so and stir the two together so it's more pourable (I'd guess about 200 degF should do it), then pour the still hot mix in the box. Thin enough to flow a bit, but too thick to really leak out, and it will certainly keep the gear faces happy.

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Frontend wander:

When a vehicle wanders and the steering linkage and tires are OK (are you sure?), usually the culprit is caster adjustment. I've never heard that the Corvair required more than what GM specified. If the front end was "professionally" realigned, have them check it again.

It's common for techs not to do caster since most cars don't have adjustments for it anymore, and older ones, the adjustments are frozen and they're not going to budge 'em and break 'em

Steering box:

If you're rebuilding the steering gear box and replacing the two seals and bushing, replace the lube with gear oil. Grease is only used in older boxes when the seals no longer hold the gear oil. The level should be near full.

U-Joint Replacement:

One would think by reading your response to "Quinto" that you are advocating replacing the U-joint with the half shaft still in the car. Is that the case? 8 bolts would have to be removed to withdraw the shaft. This has to be the easiest way to go. The actual U-joint, unless you are equipped with either a Hydraulic press or a collection of BIG c-clamps, should be left to a shop. It is a normal easy job with the press. If it is a U-joint with a grease fitting, like almost all, make sure the joint is installed with the fitting aimed toward the shaft direction, not the Transaxle or the Stub axle. This will make it possible to lube the joint after installation. Putting the half shaft back in is easier with a floor jack. Just install the inner end to the transaxle, aim the shaft toward the stub axle yoke and jack up CAREFULLY under the tire (parking brake on full). Eventually the tire will lean over toward the shaft which should be free to rotate as they mate.(Make sure the car does not come off the jackstands) Start the bolts and clamp it in tight. You're about done

Early rear bearings:.

The bearings themselves are identical to the '60-'62 Corvair (stamped steel housing) although the axles are not the same. I would expect the service operations to be identical. Remove the wheel and brake drum. Remove 4 nuts from studs that hold the bearing housing at the backing plate. The axle will then pull out far enough for the inner U-joint yoke to pull free from the splined shaft in the differential. Now you disassemble the U-joint and remove the cap screw that holds the outer yoke to the axle. It is splined to the axle and should require a puller to remove from axle. An appropriate standard puller will work. One that can bolt to the yoke is preferred. You can now pull the axle the rest of the way out of the A-frame. Pressing the bearing off and on the axle is now a conventional pressing job. These bearings are getting rare and cost a good buck to replace. Consider disassembly, cleaning and repacking if they are in good enough shape. This is done without pressing it off the axle.

Pitman arm removal

A good bash with a sizable hammer will dislodge the link from the Pitman arm. BTW, there’s no need to remove the Pitman arm from the steering gear box. I would also recommend removing the drag link in its entirety; makes for R&R of the old bushing a LOT easier. By removing the drag link, its SO much easier to clamp the whole thing in a vise and do the R&R.

Rear strut bushing install :

I used the Clarks bushings and was eventually successful, so don't give up! Some hints: I found the process in the tech guide did not work very well; I ended up with sockets stuck inside the bushings etc. I used WD40 liberally to lube everything before I started to put them together and during the process. I used a 4" bench vise - press was not necessary. Make a set of smooth jaws so you don't hack things up; I used some spare bits of sheet metal folded over the jaws. You will need various sized sockets as well as (here's the secret I think) a piece of pipe the same ID as the hole in the control arm and about 1.5" long (I used a piece of chain link fence post). Start by Lubing the bushing and pressing by hand into the arm as far as it will go. Put the piece of pipe against the arm and around the bushing. This will stop the bushing from bulging out instead of just pushing into the arm. Put the sleeve into the bushing and squeeze the whole mess together in the vice, as far as you can. Then put a socket on the end of the sleeve and push it further The tech guide talks about the danger of the end of the sleeve cutting the inside of the bushing but I didn't have any problems with this. You will likely end up with the sleeve in place, centered in the arm, but the rubber not pushed far enough in. What you want to do is work the sleeve back and forth; it will carry the bushing further into place each time you press it. With the pipe around the rubber bushing, you can even press the bushing into the arm with the vice. When pressing the sleeve OUT, you want to just press the sleeve, When pressing it back IN, you want to push the sleeve AND the bushing as much as possible. You will need to use a socket against the rubber to prevent the rubber from moving, and press the sleeve partway back out on the side the rubber bushing pokes out. Put the pipe around the bushing and press the sleeve into the arm again. This will carry the rubber a little bit further. At this point you will be lubing the outside of the rubber, but not the sleeve.

Repeat as necessary.

The first one I did took about 2 hours... the rest of them took about 15 min. each. You will need to fiddle things back and forth for awhile to get them to properly line up.

Sagging rear springs:

IMHO nobody currently makes a proper late model convertible rear spring.You could have a pair custom made by a spring co.; specs are available.as you have a/c I think I would have them add 1" to the stock length to get the height you want. Cost will probably be in the $150/175 range. Method 2- make a raised spring perch on the trailing arm. You can buy a'lift kit' for coil spring cars that looks like a couple of big washers and a pair of 3" diameter pipes about 3' long. The height of the pipe is the amount of rise you'll get, so you can cut them to suit. The pipes' sit atop the control arm where the coil spring would normally sit; a big washer and cup sit on top of that to make a new spring seat. a bolt goes through all the pieces to hold them to the trailing arm(yes you drill a hole for the bolt in it). then the coil spring sits on the new perch. cost is about $25, you can buy the kit from Napa and others.

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TIRES/WHEELS

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Wheel size:

Well I got my rims and tires on the 66 this afternoon. I put 15x7 rallies with 205/60R15 radials on the vehicle and after letting the jack down and starting to move the car, guess what - they rubbed up front. Seems they were hitting the inside of the front part of the fender up front. Well after a little body work, they now fit with no problem. Still waiting to see what happens when I go over a bump!!!

It's very common for tires to rub on the lip at the top of the wheel opening. Is that where your problem was? I think the best way to solve that problem is to put the front of the car on jack stands, remove the front wheels, get a cut-off wheel - you know, one of those power grinder-type wheels, some are air-powered, they use a little carbide wheel and will cut the heck out of anything. Anyway, you sit on the floor right up inside the wheel well and simply cut the lip. Don't forget your safety goggles too! You won't even see where you've cut when you're finished. Cut the wheel well trim and the lip. Make it nice and smooth, maybe even use a file or a wire brush to clean it up - you don't want it to cut your hand! I think you'll find the 205/60-15's to be a nice size tire for a Corvair. Before I would cut the wheel well lip for clearance I would roll the edge with a BFH. That's a big freakin hammer. This way you maintain the pinch weld. You will have to keep the dirt from staying in the lip when you wash it. Remove the trim first. you might have to trim the trim as it were but you can do that with sheet metal shears

Sizing Wheels and Tires.

One of the things that many people do to make their Corvairs faster or more unique is to install different wheels and tires, a task that can be very frustrating if you just try to put on whatever seems to fit. This article originally appeared as a four month series in the Hot Air Mail and is an attempt to help Corvair enthusiasts properly fit non stock wheels and tires, whether new or used. Thanks to the members of the Northern Virginia Corvair Club for their input in writing this article, and the members of Virtual Vairs for many of the additions and refinements. Since so many folks change the wheel and tire combination on their street cars, I've now broken this page into two sections, street and competition.

You want the tires to do what?

Let's look at the tires first. I use and recommend only radial tires, so that's what this information covers. If you want to use bias-ply tires, you're on your own, because I know nothing about them. The size radial closest to stock is 185/80 - R13, but unless you have a factory stock show car, you may wish to use a larger size. Most major tire manufacturers make several different types of tires, so to decide which of these types and in what size it helps to realistically decide how much money you want to spend and what kind of use you'll put them to. Answering the following questions usually helps:

- How well do you want the car to ride?
- How much do you drive your Corvair?

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- Is stock appearance important?
- Is all-weather ability important?
- Do you drive quickly?
- Do you want more cornering grip?

These dimensions will affect your decision in various ways, so keep the following in mind:

Width - a wider tire will generate somewhat more grip but is more likely to hydroplane, and may hit various parts of the car if the wheel size is not optimum. Also, if you want tires wider than 205mm, you must get wider wheels.

Profile - a lower profile tire has more grip, but the ride will be rougher.

Speed rating - generally unnecessary on U.S. roads, but this is an indication of a high quality tire.

Wheel diameter - if it isn't 13 inches, you will need non stock wheels.

Overall height - This affects the gearing and speedometer. Note that the height of the tire off the car is not the same as the rolling diameter, since the tire bulges at the bottom, making it effectively shorter. Although you can't easily measure this dimension, you can find often find it as part of the tire specifications, expressed a couple different ways:

- Loaded radius. Stock is 11.8" (to 65) and 12.1" for 7.00-13 (66-69 and wagons).
- revolutions per mile. Stock is 853 (to 65) and 833 (66-69 and wagons) revs/mile, according to Chevy specs. Oddly enough, the calibration for the speedometer doesn't quite match - the '66 up speedos are set for 825 revs/mile.

If you'd like to measure a tire, you need to have it mounted and on a car. Make a mark on the bottom of the tire, roll the car through ten revolutions and measure the distance the car traveled. Divide by two times pi (6.28) and you'll have the loaded radius.

If you're buying new tires, bear in mind that there is a tolerance in the specification for a given size, you should check with the tire dealer to be sure what size the tires you want really are. Also, after seeing the many sizes that folks have used and ended up with accurate speedometers, it is obvious that although stock speedometers may have been accurate when new, now that they are over thirty years old they are likely to be a bit off. The tires that produced good results with my car are technically a bit short. The upshot of this is that once you have select your tires, you should do an odometer check of at least ten miles, and if possible a speed check as well (one mile per minute at 60 MPH, do three or more miles if possible).

Having said all that, I went ahead and surfed over to The B.F. Goodrich site to come up with some examples of tires that would work well on Corvairs, see the note as for where they will fit. They have data sheets for all of their tires there, I used the specs from the Radial T/A here, other models will be a bit different. You should be aware that the sizes are a range, so it's a good idea to get the data sheet if you can, especially if you have chosen a size near the limit of what will fit. Unfortunately, BFG doesn't offer a 13" Radial T/A that will work well, these are 14, 15 and 16 inch:

- P185/70R14 (all)
- P195/70R14 (all)
- P205/60R15 (may rub on an early, fits lates)
- P205/55R16 (may rub on an early, fits lates)

These sizes will not fit an early, and probably not the front of a late due to width, but they will work well on the rear of a late:

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- P225/60R14
- P235/60R14
- P215/60R15
- P225/50R16

Wheel swapping

One of the most common questions asked is "what car has wheels that fit my Corvair?". If you have an early, the answer is pretty easy - most 70's and 80's Japanese rear wheel drive cars have the same bolt pattern and approximately the correct backspacing. For lates, it's a good news/bad news answer. The good news is that the lates use the common Chevy RWD pattern. The bad news is that the backspacing is different from pretty much every one of those cars. So, the short answer is you should measure before buying wheels you plan on putting on your 'Vair (early or late). This is not to say that you can't find wheels which will fit, just that you should not buy a specific wheel unless you're sure it will fit First. Let's start with a description of the various dimensions that are used to measure a wheel:

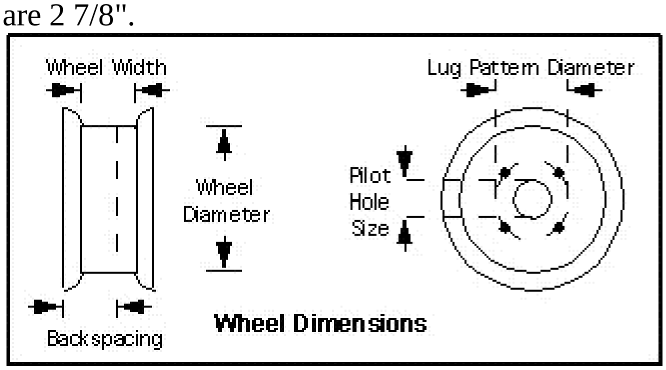
Diameter - Vertical dimension of the wheel, measured where the tire's bead seats. All Corvair cars came with 13" wheels as stock.

Width - The distance between the inner lips of the rim, where the tire beads seat. Both early and late Corvairs used 5 1/2" wide wheels.

Lug Pattern - This is the number of lugs used to hold the wheel on, and the diameter of a circle drawn through the center of the lug holes in the wheel. Earlies use 4 lugs on a 4 1/2" circle (4 x 4 1/2"), lates are 5 lugs on a 4 3/4' circle (5 x 4 3/4"). A list of possible donors is near the bottom of this page, if you're looking for info on swapping wheels for another type of car, I also have a fairly complete list of wheel lug patterns.

Backspacing - The distance from the inside of the rim to the point where the wheel contacts the brake drum. All 5 1/2" wide wheels have a backspacing of 3 7/8". For reference, more backspace moves the wheel further in the wheelwell, less backspace brings it out. [Note: I prefer using backspace to offset, since there is some difference of opinion as to which way is "negative" or "positive" offset. The stock Corvair wheel has a 1" negative offset (source- Chevrolet engineering features, courtesy Larry Claypool) - the mounting surface of the wheel is closer to the outside of the rim than the inside by 1". I will use backspace for the remainder of this article].

Center Hole Diameter - The hole in the center of the wheel that the hub fits through. All are 2 7/8".



Since the standard lug pattern for RWD Chevies from the 50's to the present is 5 x 4 3/4", lots of different wheels will fit on a late model. The pattern for earlies is uncommon among U.S. makers, but is common on Mazdas, Nissans, and Toyotas. 14", 15", or even 16" diameter wheels will fit on all Corvairs, but the width on earlies can't exceed about 6" because of two points of interference. On the front, the end of the steering arm comes close to the sidewall, and on the rear, the upper shock mounting point is close to the sidewall. Fitting quick steering arms may help the clearance problem up front, while some careful trimming may increase clearance in the rear.

Lates can handle up to 7" wide wheels in the front, with up to 8" (!) wide in the rear with the correct backspacing. Even wider will fit in certain sizes, but you will need to alter the backspacing to move the wheel out somewhat (less backspace), and perhaps roll the inside edge of the fenders. You should also check the protruding threads on the rear suspension's toe control links for clearance. It is legal in E/SP to fit any wheel/tire combo along with any fender mods to make big tires fit.

When fitting new wheels the rim should remain centered in and out relative to the hub as close to stock as possible (yes, tires sticking way out from the fenders are a bad thing), which can be determined by measuring the backspacing. This dimension is probably the most important, for the following reasons: if the tire is not centered the wheel bearings will wear prematurely because they are not loaded evenly, the tires may hit the inside or outside of the fender or other components, and the car may tend to dart around when you hit a bump.

That said, a late model Corvair has a bit more clearance on the outside of the tire than the inside, so slightly less than optimal backspace is usually best for maximum width wheels. When sizing a wider wheel, add half of the additional width to the stock backspacing to arrive at the backspacing for the new wheel. If you want to stuff really huge wheels and tires under your 'Vair, it's best to jack the car up, remove the springs so that the suspension can be moved throughout its range, then bolt on a set of stock wheels and tires and measure the actual clearance available. The center hole diameter is fairly common to many cars, but should be checked because this helps support the wheel on the hub, and of course if the hole is too small, the wheel won't go on the car. If the hole is too large, it's not especially critical, it does not appear to compromise the strength (in other words, yes, the lugs are strong enough to hold the car up, even in competition).

Some options.

To put this info together, here are a few examples of wheel and tire combinations. All of the street tire options listed keep the overall diameter about the same as stock, so your effective gear ratio stays the same, and your speedometer will be as accurate as it was before. First off, you have to decide if you want to keep your stock wheels. If so, you are limited in both width and diameter:

- Earlies have fairly small wheelwells, so you are really kind of stuck with a size fairly close to the stock equivalent of 175/80-13.
- Lates are a bit easier, as they have much larger wheel wells. You are limited by the wheel to a tire no wider than about 205mm. A P205/70 R13 will offer a noticeable increase in grip with only a slight loss of ride quality, but unfortunately this size is all but extinct in the US. Folks in Canada can still get them at Canadian Tire, I'm told.

If you're willing to buy new wheels, the options for tire sizes open up, plus you can vary the looks of the car. For street use, most folks like either 14" or 15" wheels with a 70 or 60 series tire, which give better cornering performance while still having a good ride.

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- **Early:** A good interchange for early models are the 14" x 6" aluminum wheels from a '70 - '78 Datsun Z, with P185/70-14 or P195/70-14 tires. A P205/70-14 may fit, but will be snug enough on a stock car that it would be best to mount one and check the clearance before buying a whole set. 15" x 6" were also a popular aftermarket size for the Datsuns, if you are buying wheels the backspacing for a 6" wheel should be at or just over 4" (ideal would be 4 1/8"). A 185/60-15 or 195/60-15 should work well with these wheels.
- **Late:**Many people have used a variety of 14" and 15" wheels on late model Corvairs, one of the most popular donors is the Camaro. Although these wheels do bolt up, you must be careful with the backspacing, especially on those 7" wide or wider. I suggest using the 6" wide versions, since they mount a 205 very nicely and are easier to find in a backspacing of 4", which fits the late Corvair well. You will need at least 4" of backspace on a 7" wide rim, and 4 1/2" is better. A popular choice is the 15x7 from the '82-'92 Camaro & Firebirds. These wheels have 4 1/4" backspace, which puts them about 5/8" outboard of ideal. The effects are first, the car will be somewhat more twitchy, especially when hitting a bump. Second, you are limited to a tire no wider than 205/60-15, or they will likely interfere with the fender lips (Seth Emerson wrote a nice tech tip on rolling fender lips which appears in the Corsa Tech Guide). and finally the donor cars used a metric lug nut which **cannot** be used on a Corvair. The optional 16x8 inch Camaro IROC wheel can also be made to fit, Bruce Schug wrote this note about fitting the wheels and correct lugnuts.

Bruce Schug wrote the following about using 3rd generation Camaro IROC-Z wheels on his Corvair:

My experience is with the 16" x 8" IROC Z-28 wheels. I'm sure the 15" wheels are the same. Yes, the studs are different. The Camaro uses metric studs which take a different thread. So you can't use the Camaro lug nuts. You have a couple of choices. You probably could install the Camaro studs into the Corvair hubs, which would allow you to use the Camaro lug nuts. I think I heard of someone doing this. I don't know what the situation is with the different diameter of the Camaro studs which are metric. I don't feel this is a very practical solution.

Secondly, you can keep your Corvair studs. This is where the real problem arises. The Corvair lug nuts WON'T pull through the wheel, this is a pretty severe exaggeration of the problem. The problem is the angle of the surface which the lug nut contacts is different and the Corvair lug nuts won't fit properly. This is not a life and death situation. I ran Corvair nuts for awhile until I understood and solved the problem. The Corvair nuts just chew the mating surface up a little each time they're installed. The solution is to get different lug nuts which have the standard Chevy threads, but with the angle to fit the Camaro Wheels.

I found an article in the July, 1988 Hot Rod which reads as follows: "One of the new trends in street chic wheels is the use of late-model IROC Camaro and Corvette wheels on early-model Chevys. While the 4 3/4 inch bolt pattern remains the same, the specific late-model metric lug nuts cannot be retained. Some rodders are using incorrect acorn-style lug nuts and other designs that do not offer the proper contact area for the radiused contact face - and could be dangerous. However, Ronal Wheels (15692 Compuer Ln., Huntington Beach, CA 92649, 800/552-0934) offers a lug nut for its R9 wheel (part No. 2160) with the standard 7/16 x 20 thread for early Chevy’s that works

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perfectly." I purchased 16 of these from a Super Shops speed shop. They aren't cheap, at the time they were $3.50 apiece, but they are good. I then found a set of wheel locks which fit the Corvair studs. These don't have the proper angle, so I always use them in the same hole. This way they don't ream out all the holes, just that one.

I understand there is another nut which is supposed to work. It's called a Gorilla "bulge" nut. I think Gorilla is the brand name. Bill Pritchard used to have some of these. He's in the Roster. These were less expensive than the Ronal nuts.

Another issue you should give some thought to is the length of the stud. Because of the increased wheel thickness, you have fewer threads which the nut screws onto. I just measured that my rear nuts are on 5 1/2 threads, the fronts 7 1/2. I guess the wheels are a little different thickness. How much do you need? I think I remember NHRA requiring threads equal to the diameter of the stud. A 7/16" stud would then require 8.75 threads, more than I have. Longer studs are available. Someone gave me a GM part # 3910340, which is a Corvette stud which is 1/2" longer. I use stock studs and have never had a problem. My use has included spinning my car a few times, once on the street, the rest at autocrosses, with 225/50-16 Gatorbacks. If you decide to use longer studs, be sure your lug nuts have enough depth to accept them.

Seth Emerson also posted the following on lug nuts:

At a recent trip to the tire store, I noticed that McGard, the company known for their locking lugs for wheel-theft protection, makes a standard (non-lock)"bulge-style" lug nut in a 7/16 RH thread. This thread is the size to fit our Corvairs. These nuts are needed when aluminum wheels from newer cars, for instance the 82-92 Camaro, are used on our Corvair's non-metric wheel lugs. The drive hex is still the same size as stock. The bulge-style nut has an exaggerated cone at the contact point between the lug nut and the wheel. This cone keeps the tips of the lug nut hexagon from digging into the wheel cone when you tighten down the nuts. The McGard number is P/N 64011 (this P/N gives you a set of four nuts, buy five sets to get your 20 lugs for your late model!) Remember you have to find the 60 degree "bulge" nuts in 7/16-20 RH threads.

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- Take a look at this lovely late convert with IROC 16x8's and 225/45-16 tires. Note the places to check for rubbing.

Personally, I've been very happy using 205/60-14 tires on 14" x 6" Chevy steel wheels on the front, and 245/60-14 tires on 14" x 7" Chevy steel wheels rear. Backspace is pretty close, 3 5/8" (ideal would be 4 3/8") front, 4" (optimum 4 7/8") rear. With these, any road imperfections are noticeable, but the ride isn't especially harsh, and the increase in grip is quite large. This front tire size gave me an accurate speedometer too, although it is technically a bit short.

Competition tires.

For Street Prepared autocross use, I highly suggest you acquire a set of "R" tires if you're planning on running more than one or two events per year. The reasons are:

1 - Regular autocrossing (say 10 events) will completely wear out your street tires. It is **cheaper** to run real tires than to "save money" by trying to get away with a single set of tires. Sometimes you can get closeouts of the previous year's tires, or buy a set used if you're on a tight budget.

2 - R-compound tires have so much more adhesion than even high performance "normal" tires that tuning the chassis and learning to drive on anything else is, to a degree, a waste of time. The car rolls more, the bushings deflect differently, and the tires break away differently.

3 - Selecting a set of tires for competition in some ways is easier than selecting street tires, especially if you are going to have two sets of tires for the car. In fact, that is the first decision you will need to make - do you want to have a second set of tires, and if so, do you want to change them at home or at the event.

If you elect to have a second set of tires and are willing to change them at the event, you will need to take a jack and lug wrench, plus you'll need to stuff them in the back seat and trunk, limiting space for other things or passengers. The up side to doing this is that you can choose tires without worrying about ground clearance, speedometer error, or highway gearing considerations.

Your other choice is to run your race tires on the street, either all the time or just to events. This worked well for me, as I don't drive the car much (~5000 miles per year), and our events are generally about 30 miles or less away. This way poses limits in that you can't use really short tires because of ground clearance problems and you'll be very limited in highway cruising speed - don't forget that a stock Corvair turns about 3500 RPM at 70.

Here's a point that's worth mentioning - lower is better when it comes to handling (you can read more about why in Fred Puhn's book on handling). So the best choice for a Corvair is usually considered to be a 13" wheel with the lowest profile, widest tire you can put on it, which is a 215 or 225 width 50 series. The downside is that wide 13" wheels are uncommon, so you'll have to either find a used set from another Corvair racer, or have some made. 14" wheels are pretty common, and with a 50 series tire you won't have to worry much about clearing the fenders. Either of these setups will probably be too short for the street, so you should plan on two sets of tires if you choose one of these options.

If you want to do what I did, my autocross setup is a set of 15" x 6 1/2" SenDel mags with 5 1/4" backspacing, with 225/50-15 BFG Comp T/A R-1 road race tires. These fit very nicely, with no interference. In fact, they are backspaced a bit too much, the ideal would be about 4 5/8". I suspect these wheels are actually for a 4WD Chevy S-10 Blazer, since the backspace on a stock wheel from one measures about 5 1/2".

Tire pressure.

The factory recommended tire pressure settings were made with comfort on bias ply tires being an important condition, and to dial in a great deal of understeer. Although radial tires are much better, you should still maintain a pressure differential of 8 to 10 pounds front to rear, but you can improve the responsiveness and handling by raising the tire pressure up to about 25 front, 35 psi rear for street use. Autocross use is a bit trickier, as the construction of the tire has an effect on the amount of pressure in the tire. In short, there are two types of "Street" tire:

The first is what most people mean when they say street tire, that is a tire designed to give a reasonable service life (~40k miles), good all weather performance, and perhaps a sporting amount of grip. The BF Goodrich Comp T/A HR4, Goodyear Eagle Aquatread, etc. fall into this category. These tires have a relatively soft sidewall which gives them a nice ride, but they unfortunately allow the tire under hard cornering to try to roll under the rim, meaning you're now cornering on the sidewall instead of the tread. Bad plan. The proper solution is to get a set of competition tires (see below) which don't do this. But if you're just trying out the sport, there is a band aid fix - more air. The additional pressure will stiffen the sidewall, which will help the handling, up to the point where the contact patch is so much smaller that the tire slips anyway. Generally, a 5 to 10 psi increase works well, *but* you may need to increase the front and rear tires different amounts to make the car well-balanced.

Here's a procedure, from a post by Mike Lukacs to the autocross list (Team.Net):

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The classic method of determining correct tire pressures for autox is as follows:

- A) raise your tire pressures to ~10 lbs above mfg recommended pressures to start.
- B) mark the outside tread/sidewall corners of each tire with 3 or 4 patches of white shoe polish (sneaker polish) spaced around the tire.
- C) after your first run, check the shoe polish patches to see if you are using the whole tread width, but not rolling over onto the sidewall too much.
- D) if the shoe polish is getting rubbed off of the sidewall area, raise that tire's pressure by 1 or two pounds. If the shoe polish is NOT getting rubbed off of the outer tread area, lower that tire's pressure by a pound or two.
- E) repeat steps B, C, D, until you are happy.

Caveat: this method is only approximate, a tire pyrometer to measure the evenness of temperature across the tread is better.

Note: Don't forget to go back to your normal street pressures before you leave the event!

DOT race tires

The second group are "R" tires, that is tires which meet the letter of the DOT regulations for street tires, but are really meant for competition use. Goodyear's Eagle VR-S, Yoko A008-RSII, and BFG's Comp T/A R-1 are examples of this breed. These tires have the sidewall stiffened to avoid the tire rolling over on its shoulder during hard use, so using the 25/35 tire pressure is still a good baseline.

Interchange tricks.

What to shop for at swap meets, junk yards, etc.,

Earlies have 4 lugs on a 4 1/2" bolt circle. Other cars with that 4 on 4 1/2 pattern are:

Acura Legend '86 to '89
Chevy Nova, Chevy II '60 to '64
Chevy Sprint '85 to '87
Buick Special, Olds F-85 '61 to '63
Datsun/Nissan, most RWD models to '89
Dodge Colt '79 to '92
Ford Falcon, Mustang (6 cyl) '60 to '73
Ford Granada, Maverick '81 to '83
Hyundai all years
Mazda 323 '86 to '89
Mazda 626, RX7 '83 to '87
Mazda GLC '81 to '85
MGA, MGB, MGC all
Mitsubishi, most 4 lug all years
Nissan 240SX all 4 cyl
Nissan Altima '93 to '99
Olds - F-85 '61 to '63
Plymouth Arrow, Sapporo '79 to '88
Saab, all to '87
Toyota, most RWD except PU and MR2 all years
Triumph TR3 through TR6 all

One thing to bear in mind is that the FWD cars listed here will have a lot of backspacing, so measure before you buy.

Late models use 5 lugs on a 4 3/4" circle, other cars include:

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Buick: Regal, Century, Special (most mid-size) '64-'80's
Chevrolet: most RWD, including 1/2 ton vans and trucks (includes 4WD) '49-'89
Corvette all
Oldsmobile: 442, Cutlass, F-85, Toronado (most mid-size) '60's-'80's
Pontiac: GTO, LeMans, Firebird, Grand Prix (mid size) '64-'80's
Note: Although the wheels used on some BMW's are almost the same size, they are actually a 5 lug on 120mm bolt circle, which is 4.72 inches.

Backspacing:

For 7" wide rims used on a late car, the correct backspacing is 4 5/8".
For 8" wide rims used on a late car, the correct backspacing is 5 1/8".
Stock rim width is 5.5".Roughly speaking, 15x7 wheels with between 4 and 5 inches of backspace are what you're looking for.

Aftermarket Wheels

I run 205/50VR-15 Yokohama A008's 27 psi F / 36 psi R on my '65 Corsa Convt. The tires are on 15x7" Enkei EN-24 (?) wheel that were made for an older Chevy S-10. I spent a lot of time (about 8 yrs ago) looking for a vehicle that had similar offset with the same bolt pattern & the S-10 was a pretty good match. Perhaps there are others now... The size of EN-24 I have is (alas) now discontinued, but I managed to scrounge 2 more as spares. They still make a 15x8", though.

My setup sticks like glue & has no interference problems, although it does lower the car and raises the final drive ratio. I switched the differential from a 3.55 to a 3.27 to compensate somewhat, and engine speed now runs 3500 at (indicated) 70 mph. If I ever get new tires, I'd probably look again for a 215/50-15. I think Fulda was the only place that used to make these, and I liked the Yoko's better. Alternatively, a 205/60-15 would probably work well.

Kelsey Hayes Wire Wheels :

Kelsey Hayes wire wheels were available as a factory installed option from late 62 through 64. None were ever factory offered for sale on late model Corvairs. The only difference between them is the emblem in the knock off hub; 64 is different than 62/63.

Effects of backspacing:

A **smaller backspace** such as 2" (negative offset) will make the **track wider**.

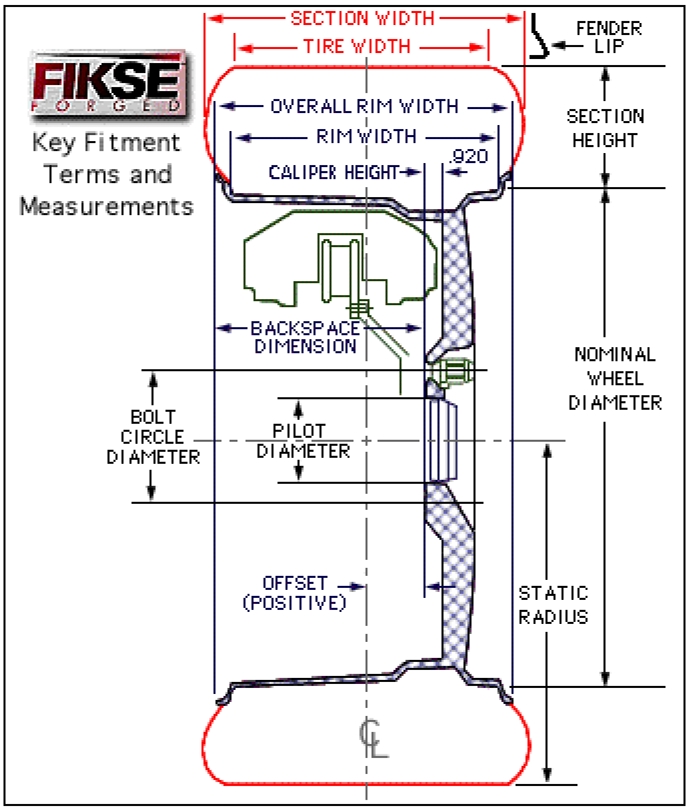
A **larger backspace** such as 6" (positive offset) will make the **track narrower**.

A.) The effects of small backspace (negative offset):

1.) Places the weight of the tire and wheel farther outboard away from the suspension.
a.) This will result in increased loads and stresses on wheel bearings, ball joints, bushings.
b.) This may cause steering wheel kickback and increased steering effort,
c.) This will also create a greater scrub radius and increased tire scrub and wear

B.) The effects of large backspace (positive offset):

1.) Places the weight of the tire and wheel farther inboard and closer to the suspension.
a.) Too much may cause clearance problems with brake calipers, suspension parts, etc.
b.) This will reduce loads and stresses on bearings, ball joints and bearings.
c.) This will reduce steering effort, and scrub radius and reduce tire scrub and wear .



Repairs to stainless steel wheel covers

No recommendation on the mags, but I have had pretty good luck repairing many pot metal parts and even a few cast items with a product called "Lab-Metal". It comes in regular and high-heat versions (350 and 1000 deg. max, respectively) and is a shade on the expensive side but it works as advertised and can be worked/machined successfully by a ham-fisted hack like me with basic tools.

TURBO/PERFORMANCE

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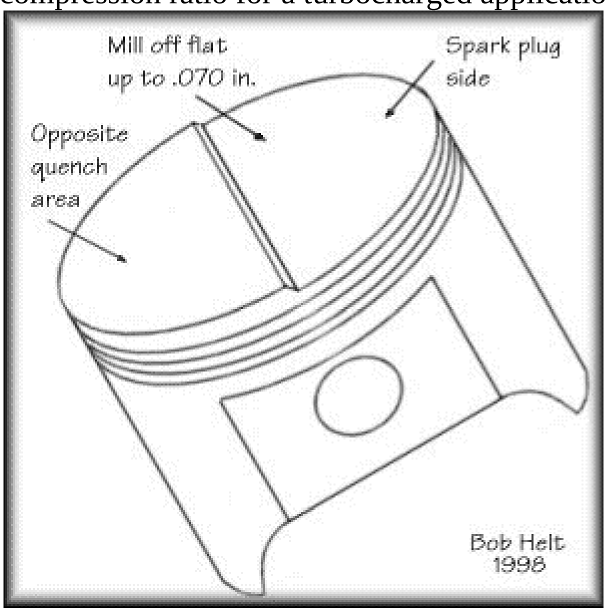
Lowering Compression:

The best way to lower the compression ratio is to have a machine shop mill up to 0.070" off the top of each piston in the area not opposite the quench area in the head, as shown in the illustration. This will produce fairly consistent results that won't require "CCing" or piston rebalance. By milling out the step in the head and setting the gap to 0.035" we have improved the quench action but this may not be sufficient to allow operation on regular gas. A further milling of up to 0.070" off the top of the pistons under the valves and spark plug (and not opposite the quench area) will lower the compression ratio. We now have the optimum condition of efficient quench action and highest possible compression ratio for a turbocharged application.



Turbo Distributor advance:

If we take a look at the total ignition timing advance (static+centrifugal+vacuum/retard) for all 4 Corvair 1965 engines we can see what a disadvantage the 180 has compared to the other engines. Let's say we're cruising along at 3000 rpm (around 60 mph) with light throttle (say 10 inches of mercury intake manifold vacuum) trying to get reasonable gas mileage. Under these conditions the 95 hp engine (manual trans) will have 36 1/2 degrees total advance, the 110 will have 35 degrees, the 140 will have 47 degrees and the poor 180 only 24 degrees! Since the centrifugal advance for the 180 only starts at 4000 rpm and it has no vacuum advance, it's stuck with the static 24 degrees at anything below 4000 rpm and non-boost conditions. This helps contribute to it's poor throttle response (aided and abetted by the long distance from carb to intake valves) as well as it's reputation for poor gas mileage. With it's low compression ratio and higher octane gas requirement, the 180 deserves and can handle a significant vacuum advance. In the years

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that the turbo engine was produced one wonders why the factory didn't devote time to sorting out a mechanism for both vacuum advance and pressure retard on the same distributor. Wouldn't it be ironic if the "fix" was actually in the works by that fateful day in April 1965 when word came down from above that only safety-related development work could continue on the Corvair?

Tuning the YH (drippy carb) posted by Steve Goodman

Typically the fuel dripping after shut off is: slightly too high float level/slightly leaking needle-seat/too much fuel pump pressure/tiny leakage in the accelerator diaphragm. These are not necessarily in order. I have seen engines with a low comp cylinder cause the leakage too, when the engine is shut off a little 'cough' occurs and pushes pressure back into the intake forcing some fuel from the carb.

Obviously the turbo engine must be very right inside to make it perform. Points that will work in a carbbed engine will float in a turbo distributor. Fuel pumps that are marginal will work in a 110 but won't in a turbo, especially under boost conditions. If anything in the ignition system is poor (plugs/wires/cap etc) the engine will not perform properly. Sorry, got off the subject a little there.

Adjustment of the idle speed and air mixture begins with starting the engine and warming up at least a little until the choke is off. Turn the idle speed to the 900rpm range and then slowly SLOWLY turn the air mixture screw inward until the engine begins to stutter (drop rpm). Then turn outward about 1/8-1/4 turn. If the idle speed has changed during this, re-adjust the idle speed and then double check your work. If the air mixture screw makes no difference when fully seated, typically there is an air leak in the carb. The mixture screw taper is very sharp and the adjustment range is very narrow.

Typically ithe problem is the gaskets and/or surfaces between the two carb halves. It can be the gasket at the base of the carb to turbo also and on rare occasions, if the orfice in the end of the vent tube has been screwed around with and the opening is wrong, the mixture screw will not work. Many times folks heavy hand the big 9/16" nut on the top of the carb to turbo and will warp the pot metal carb body. This will give the air leak easily.

I like the electric choke and, I use HOLLEY 45-258 cover. It is easy to install and I wire it to the oil pressure system; if the engine is running then the choke is getting voltage. DO NOT use the wiring to the ignition coil, it robs needed voltage to the coil, plus the choke is excited when the key is turned on. If you have a little difficulty in the initial starting, the choke is already hot; bad thing too, you need the choke with the early side drafts when the engine is cold.

Using the B flow exhaust

Will certainly bring boost up quicker, you will experience a restriction in the exhaust flow however, there are 'part throttle' waste gates to help when not in boost. Using the quick boost is a good way to overrun the turbo and put too much pressure into the engine inducing ping/detonation and even to the point of breaking rings/pistons and shortening rods. Sorry, those are possibly a bit remote on the failure list but still are possible. I would suggest strong pistons, a very good engine rebuild and probably a SAFEGUARD ignition control system that is sold by Ray Sedman who is on the vv list too. Hopefully he will post you also as well as other turbo owners. You must decide what induction system to use, certainly the YH will restrict your boost levels, you might look at either a downdraft 2 or 4bbl or even FI if you want to spend time fooling around with the metering stuff. Warren Leveque does the carb adapter stuff. Your cam choice will be critical too, I recommend the stock GM turbo cam.

TURBO 140:

The smaller wheel/housing size will naturally restrict the exhaust more than the larger wheel/housing. The only time that 'breathing' is that much of a problem is when there is NO boost, then the exhaust restriction comes into play. There was a time that part throttle waste gates were the vogue to eliminate this. Boost is easier in the lates because of being able to flow more air through the carb and larger compressor wheel. Remember that there are still the restrictions of carb/exhaust.

I would NEVER use 140 heads, the cooling is less because the large ports have blocked off part of the fin area, the intakes are too thin to hold up to the pressures and the valve seat failures can cause complete engine failures. In my own experiences through all the years, the 140 heads gave minimal gain, remember that the turbo is pushing the mixture into the chambers, it doesn't care how big the opening is, the mixture is coming in. Also remember that unlike the usual hotrodding practices of port/polish etc., none of this needs to be done to heads for turbo use. What you do need is the very best of ignition systems/exhaust packings and gaskets/the exhaust system itself/highest quality internals consisting of pistons and the cam. Balancing of parts is absolutely essential (my opinion anyway) because you are letting the engine run the rpm range in each gear. 95hp heads will do fine, remember that you need to engineer the oil drain in the right head and buy an adapter for the thermister (head temp sender) for the left head. The vendors have the adapter. I would pressurize the two carbs instead of using any draw-through system, intercool, NO WATER INJECTION, safeguard system. I did one of these years ago when parts were fairly crude, Dave Binnie refined my ideas and has one hell of a car with the new technology. You can see Dave's car on Gary Aube's web site. I would suggest that you build one EXACTLY like Dave’s. If you don't like that idea, use a two bbl downdraft adapter for the draw-through system, probably use the b/f combination turbo so the waste gate isn't necessary (at least until you try it out), the safeguard and a good rebuild.

Also can you run the engine with a 140 distributor ?Absolutely NO 140, I have had the best luck with either the stock distributor WITH THE RETARD or a push-pull unit from DALE or a 95 distributor (part #1110310) and maybe some work on the weights and springs. (I have a distributor machine so it is easier for me)

Mike Mann: re Turbo

Major differences are a bigger turbo and carb. if you use a early exhaust housing with a E-flow on 140 heads you will see over 20# of boost. TRW pistons are good for about 15#. a wastegate will be needed so you can keep the boost pressure down to 10. the safeguard detects pinging and will compensate the timing until it's eliminated. with this you probably wouldn't need water injection. with the 140 heads you will need to lower the compression ratio. try for 8:1 or 8.5:1 measured. If you use the turbo exhaust crossover it's about 1/4" to short to fit the 140 heads. just cut and widen. on mine found that the turbo dist worked better that a 140. not sure how the stock crossover pipe will work as I
suspect it might be a little short also. I think I would go with the small valve heads, e-flow with a early exhaust wheel and a late model carb. less work and still a strong engine

There's a few people that have had Turbo 140’s done it successfully; many more

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unsuccessfully. Your valve seats had better be in there very tight. Losing a valve seat on a turbo motor can pass debris into the turbo, ruining it as well as the head. If you're looking for reliability, it's probably not a good idea. 95 heads are a good choice; they have a good combustion chamber. I'd definitely use them over the stock turbo heads. You'll have to add a drain for the turbo, but some just add it to the valve cover. You'll also have to get an adapter for the thermistor, if you use one. **Stay with the 95 heads**.

Intercooling won't work with a draw through carb setup (like stock). When the air/fuel mix is cooled, the fuel will condense out of the mix and puddle in the intake. Intercooling only works with port injection. Is a waste gate indicated? I think they're a good idea; it lets you regulate the boost level as needed. It's really the only accurate way to keep out of extreme boost levels. Supposedly the TRW forged pistons have problems at high boost levels. I think the stock 140 distributor will have too much advance for your turbo engine. You might want to talk to Dave Langsather of DALE about what distributor would work best. 503-364-8685 in Salem Oregon.

Seth Emerson:

Dave - I see myself in 1972. You are building exactly the motor I built. I subscribed to the hot rodders motto. "If some is good, more is better, and too much is just right!" If I were building another motor of this type today, I would take a slightly different approach. Number one , Build a Fuel injected, electronically controlled motor. It will cost you less in the end. It will still be expensive though. This applies whether or not you turbocharge it. Number 2 - Start with 140 heads, but if you decide to turbo it minimize the volume of the intake path. Remember you have to pressurize everything ahead the valve before the pressure enters the cylinder. That is turbo lag. If you decide to turbo or super charge it, Decide on a certain PSI level and build for that level. That way parts will stay in one piece. I think a small supercharger might be more effective than a turbo. It would certainly have more low end, where you actually drive. If you do end up with a suck through turbo, check out Warren Leveque's progressive Weber. I think it would be the only way to go for that type.

Ray Sedman:

You are correct, the early turbine will spool up faster than the late. When you add an E flow impeller you have to be a bit careful with other engine mods as it is easy to over boost the engine given today’s fuels. You will need to be on the listen for spark knock and it is prudent to install an accurate boost gauge as the factory gauges are for 'entertainment purposes only'. A stock YH carb will restrict the intake side enough to limit boost to about 10 psi with the E flow, given everything is working as it should in the engine. You'll never have over 10 psi with the stock carb no matter what modifications you make. At that pressure level, spark knock will quickly damage an engine. Broken rings and pistons can happen in a blink of an eye as the factory pistons are cast and not that stout. The early turbine will net you boost faster, but may give you too much exhaust back pressure; you need to tell us more about just what other mods you plan to make to the engine.

Ray’s Reply after mods revealed:

The combination of the E flow compressor and the early turbine with the Crown housing will net you a lot of boost, very fast. Typically, I would not suggest this setup on the street, but you are planning on installing a water injection and a wastegate so you should be O.K. Using the Weber 32/36 DFAV you should be able to obtain the 12-13

PSI level of boost with your setup. With appropriate controls such as water injection and active knock retard 12 PSI is a reasonable level of boost to run and have the engine reliable. Without active knock retard you will have to diligently listen for knock and back off of the throttle instantly. At 12 PSI if knock sets in, it is very possible to instantly break piston rings as well as damaging rod bearings and pistons. Forged pistons are a must as any type of cast piston would not be up to this type of abuse. Running the SafeGuard with individual cylinder retard will probably net you a gain in torque of at least 12% over a 'retard all' system & more if the system is not closed loop in the knock detection frontend.

Frank Burkhard:

You'll probably get lots of differing opinions on all the questions you asked. However, if you place the turbo downstream of the carb (like the Corvair stock turbo location) then you CANNOT run an intercooler. Tom Keosababian ran a 140 engine with a larger turbo and a 4 barrel carb to achieve a 156.9 mph average at Bonneville. He used LOTS of water injection to keep from destroying his engine. Since you are making a street engine, I
would advise running a vacuum advance instead of a pressure retard on the distributor and using Ray Sedman's SafeGuard (as well as the water injection) to keep out of detonation. What type of water injection are you considering? The most important part of water injection is CONTROLLING the flow of the water so you have it only when it does some good. How will you turn on the water flow? How will you vary the flow of the water to give what the engine can use? For a street driven turbo car, insulating the exhaust piping between the manifolds and the turbo will reduce turbo lag as well as give you higher boost levels. Unfortunately, this can easily overheat the stock exhaust system, so stainless steel piping is recommended if you insulate. You'll also need to add a larger than stock boost gauge and additional temperature indicators to warn you before you get into trouble. Also Warren LeVeque (Levair@aol.com) builds water injection systems especially for turbocharged Corvair engines. One distinct problem is that the 140 heads have smaller cooling passages than the 180 and 110 heads due to the space required for the larger valves. So you may go like the wind but not for very long. To those that aren't interested in stock. with a early (b-flow) exhaust wheel and a e-flow compressor I can use a 20# wastegate spring. system will develop more but engine won't handle it. if you want less turbo lag go to a smaller exhaust scroll and limit the boost to 10-15#.
performance is unreal-mike mann

So start with a 164 cid engine having a 65-66 140 or turbo crank. Then rebore the cylinders only to gain a perfect surface. Use new forged LM pistons. Moly or Totalseal rings. The OTTO OT 20 cam should be the best. Turbos don't require high rpms. Stick with something near stock configuration on the cam. But use the Otto failsafe cam gear and locking ring. It's the best for reliability (and this gear retention is a weak point of Corvairs.) Then HD valve springs. With this setup you will have to open up the combustion chambers to lower the CR back to 8:1. Or you could get some 64-66 turbo heads. Remember to match the cylinders you are using to the heads, or modify the heads as necessary. Roller rockers are expensive. You probably don't need them. Many tuners have good luck with the SU carburetor.

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Turbo 140

Having had considerable experience with this, here are my recommendations: First and foremost, get one of the reputable shops to do the valve seats in a manner that will keep them in the heads. That is the SOLE failure I had with my turbo engines, dropped seats. I feel this is a MUST. Next: you will need to drill and tap the rocker area on the right head for 3/8" NPT, and screw in a piece of 3/8" pipe, so it comes out in the same place as the oil drain on the 180 heads. Remove the vacuum plugs and tubes on the intake manifold flanges, and run a 1/8: NPT tap into them. Plug the unused ones, and screw in the fittings for the pressure retard unit and the manifold pressure gage. I would leave the combustion chambers alone. Do the ***step cut pistons*** to lower the compression. And of course, block off the two unused carb pads!! Adding a 4 leg setup doesn't buy you enough to fool with it. And of course, you'll need to trim the sheetmetal to fit the 140 shrouding, or the 180 shrouding. This is what I did, and I loved the results! Issues I had: Needs better oil cooling! Get an RX7 oil cooler with the he built thermostat. Definitely run better than stock pistons. I didn't have such good luck with TRW. Try the hypereutectics. They are the state of the art. This one I've done. Unless you are going to run at Bonneville, just cover over the two secondary ports and use a stock Turbo crossover to blow into the heads. You don't need to do much to the heads except don't raise the compression at all! Maybe use thick head gaskets. and mill the piston top under the valve pocket area to reduce the compression ratio. Use a turbo distributor or spring for Ray Sedman's electronic gizmo. You will be a frequent buyer of the best premium you can find. Modify a set of 110 or 180* exhaust manifolds to fit over the 140 exhaust tubes and use a stock 180 crossover - If you **Jet-Hot coat it**, it will last longer. You might try Jet-Hot coating the manifolds, too. It will trap more heat and give quicker boost. Have fun! -Seth (*try using 110 exhaust manifolds and the turbo exhaust pipe. won't make as much total power but really reduces turbo lag and it comes on much sooner than the 140)

2.My 65 Vair (driven daily) is the 140 with turbo installed has the compression lowered by using 2 head gaskets. I still need more than the 92 octane available at the pump. With each tankful I put in 3 gallons of 100 octane racing gas at $5 per gallon. I used a welded on addition to the passenger side valve cover to return the oil cooling the turbo. I modified the 140 passenger side shroud to allow the exhaust return. I modified the top shroud from the turbo engine (both were done with a Dremel Moto.) The forged pistons are a must, factory pistons can't take it. Ask me how I know and see me cry. The turbo distributor is a must as well. A modified exhaust pipe was made adding the larger u-pipes from the 140 to tips of the 180 pipe (but lots of guys have just beaten the opening till it was larger), bottom line, a gutsy ride. Isn't that why we drive the Vair?

3. Plan on using pin drilled pistons as TRW's won't last. finish the top of the pistons like Bob Helt. article shows in the tech guide. you will need to cc the heads as compression ratio is critical. think I ended up with 8.5-1. had to use extra base and head gaskets. on the exhaust I used 110 manifolds with the turbo exhaust pipe. it needs to be widen about 1/4" in the middle as the 140 heads are wider. the smaller exhaust logs will keep the exhaust gas velocity higher thus lessening turbo lag. a compressor by pass valve helps also during shifts. the diff on mine has 3.27 gears which works well as I wanted a road car. lots of time and money to do this correctly

4. A wastegate is a ***VERY good idea***!! Not only do you get predictable and repeatable boost levels, but you can run a tighter housing, and get your boost in sooner. I ran both

the 3.27 and the 3.55. Quite frankly, it wasn't a night and day difference. I did a LOT of highway driving, so my preference was the 3.27. However, around town, the 3.55 was a little more responsive. Personally, I'd ditch the posi. The only thing it did for me was induce understeer. But then again, tire technology in the 70s isn't what it is today. As far as a wastegate goes, I would suggest the Turbonetics Deltagate. They also sell the weld on flanges. Fairly straightforward. I'd mount it below the engine sheet metal, as there is probably a bit more room, and you'll keep all that hot added plumbing out of the inlet cooling air. My other suggestion, if you don't mind going further out of stock, is a turbo with an integral waste gate, like the Garrett unit used on the Nissan/Datsun 280ZX Turbo. There is a carbon seal retrofit kit for these. Plus, you get a more modern, SIGNIFICANTLY lower inertia turbo with a lot more efficient compressor section.
5. 3.27 instead of 3.55: I run a 3.27 for all of the previous reasons. I often short shift (early) at 5000 or so to make the boost come on more quickly. This only works if you spend virtually no time in the naturally aspirated mode. If you are temporarily N/A , then more gearing is faster. I have full boost in less than a car length. I often take a 2nd gear corners in 3rd instead. It's a whole new way of thinking. " hydraulics instead of flow".
6. if you want a mild mannered street turbo why not run a late compressor with a early exhaust wheel? should provide at least 10# of boost which is about all the stock pistons can handle. water injection might be need but a safe guard unit is a better way. you can skip wastegates, compressor by pass valves and etc. with this setup
7. I agree with that proposal, and, a wastegate and a tighter housing would give better results, and a more responsive engine. Furthermore, draw though setups don't need a compressor bypass valve. Slam the throttle shut, and the wheel is spinning in a vacuum! Not much chance of surge in this scenario. All in all, a simple mod to add a wastegate. Even simpler if you use a modern turbo with one built in! Although some adapters will need to be made...
8. There are two things you will need to do which are unavoidable, if you want it to live with 140 heads. 1. You WILL need to lower the compression ratio. Best way is compression cut pistons. 2. You WILL need to do something to make sure the seats stay in. 140s are notorious for dropping seats as it is, and the added heat of a turbo will make matters worse. There are several vendors which can do a bang up job on the seats. If you do that, you'll have a fun, fast ride! Expect a better top end as well. These heads will WAY outbreath 180 heads. My experience was more power overall, but it pulled strongly much higher up the RPM curve.

Dynoed Turbo HP

Engine Specs:
Basic 164 cid Corvair block
.060 TRW pistons
5 cc valve relief pockets in forged pistons
140 HP oversize ,tight seat heads ,with 1/2 of gasket seat removed.
No cylinder base gaskets.
.032 copper head gasket
Approx. 9/1 actual (not advertised) compression ratio
Otto TB 20 camshaft (270- 280 advertised duration)
Crown Hi-po exhaust housing , 180 hp turbine size
E Flow impeller and housing

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45 DCOE Weber-LeVair vacuum secondary--33mm primary venturi, 40 mm secondary venturi
Turbonetics wastegate with manual boost control (18-20 psi gauge max.)
102 octane Turbo Blue leaded race fuel
95 hp 4 speed distributor/Pertonix point replacement/ Source-coil
MSD Boost Retard + Rev limiter (adj 1-3 deg/1 # boost -retard)
Competition Cams (Ford) Roller tip rocker arms
Runs were limited to 5800 rpm (max power- engine will rev much higher)

This is rear wheel horsepower on a chassis dyno with full street gear. Engine horse power would be 20/25% more.

All boost is Psi Gauge- not inches like the stock gauge

9 psi with Correct Turbo muffler 145.8 hp
15 psi as above 167
15 psi muffler removed 189
18 psi jets: 185 and 205 201
18 psi jets: 195 and 205 203
18 psi jets: 205 and 205 203.7

Best torque was 220 ft lbs at 4600 rpm.

The dyno shop said that the horsepower was equivalent to 255 flywheel hp. Note that at half boost (which I run at long events) hp is around 200-flywheel

Most important note:

The horsepower had about a 25 deg slope from 3200 to 4600 and then stayed at max (flat curve) to 5800 The torque had about a 5 deg slope from 3200 to 4000 , flat and max from 4400 to 4800, 5 deg down from there to 5800 : for all practical purposes - -flat.

Turbo Vacuum\Retard

The main issue with installing the Dale vacuum advance/retard unit on a turbo is that if you set the timing to 24 BTDC with the vacuum hose disconnected and plugged, when you hook the hose back up your timing will be around 34 BTDC. At wide open throttle (WOT) you will still have proper timing, but your idle quality may be poor and you may get off-idle stumble and hesitation when the timing drops a bunch as you let out the clutch and start to move off the line.

If you set the timing to 24 BTDC with the vacuum hose connected and your timing at 24 BTDC, you will have improper timing especially during WOT (about 10 degrees short). At idle your timing will be at 24 BTDC, but as soon as you let out the clutch and start off the line your timing will drop to 14 degrees or so. Moving a turbo off the line is not the time when you want to retard your timing. The low compression ratio, and comparatively poor throttle response of the engine needs all the ignition lead it can get at that time.

The Vacuum Advance/Retard Kit for Dale units cuts the stock manifold vacuum hose's signal on and off according to engine speed. This allows the Dale unit to advance and retard properly without causing timing problems either at idle or at WOT. You will need to get a vacuum solenoid from most late model cars to use the Vacuum advance / Retard Kit. These are easily obtainable at junk yards.

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TURBO carbon seal inspection,

I assume you are trying to avoid the high cost of a new carbon seal (I can relate). Based on that, I would do the following:

1) Check the carbon seal face and mating ring with a magnifying glass for pits and scratches. Even minor defects can allow a leak at turbo speeds.

2) Important: Replace the small o-ring under the carbon element (this is where most of the leaks are).

a) This is easy if you have the replacement style of seal where the o-ring can be replaced.

b) If not, I have been successful in replacing the o-ring in "some" original GM units. First, pry gently on the metal retainer to pull it up out of the aluminum housing slightly. Then, push down and turn the carbon seal to remove it. Then finish removing the metal retainer to get at the o-ring. Sometimes it is impossible to remove without ruining the carbon. Be sure to use the correct viton material. IMO, don't bother to reassemble the turbo without replacing this o-ring.

3) Replace the large o-ring around the aluminum carbon seal "plate"

4) On the exhaust side, check the "piston ring" seal, its groove, and the mating ID of the center housing. The rings are cheap, so I suggest replacing. The ring must be free to rotate in the groove, so make sure there is no carbon in the area.

5) Previous posts on making sure the drain is clear.

SEALING TURBO X-OVER

Like most automotive problems, it will NOT fix itself. I have found that the early x-over/inlet pipe is easier to seal but more difficult to take apart later, the second design has more difficulty in sealing but is easy to remove. What I do with the second design is use a little muffler sealing compound (comes in a tube like toothpaste) and apply a ring of it around the packing. I don't use a lot, just use it like a normal gasket sealing, then install the x-over and tighten, let it set up for an hour or two before starting the car, then the heat from the exhaust will make it harden. ALMOST every time, this works.

WATER INJECTION

I wouldn't even bother with water VAPOR injection. Typically all it does is humidify and cool a SMALL PORTION of the combustion air. If you run the car in the rain you are at least using ALL the combustion air at 100% humidity. So little water is added to the combustion process by water VAPOR injection that the effect, IMHO, is negligible. If you want to run with water injection use one of the commercial systems (frequently showing up on eBay) that injects LIQUID water into the top of the carbs. Under the "Tuneup" Section (page 6) of the Tech Guide, Robert Stout discusses the benefits achieved in using an Injectronic water injection system to eliminate pre-ignition. Under "Performance Items" (page 23) Warren LeVeque also mentions using water injection for highly boosted turbos. Some years ago I was having trouble with pinging on Charlie 2's well worn 110 engine so I built my own water injection system using 2 mist spray plastic nozzles from kitchen cleaner bottles (high tech) and a surplus gear pump. Since I didn't have a sophisticated electronic controller, I simply used a push button on the dash to activate the pump. Actually my "organic controller" was even more advanced than the silicon kind because it "knew" ahead of time when I was going to accelerate so I could

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push the button BEFORE acceleration took place. As long as the nozzles didn't clog, the system worked well and eliminated the dreaded "coke bottle rattle". However, if I forgot to push the button, the sound of the coke bottles in back reminded me of my failure.

The purpose of water injection is to be able to run normal engine timing without detonation. The evaporation of the water cools the intake charge and slows down the burning rate similar to an octane increase. I f you are willing to pay $4.00/ gal for 113 octane racing fuel and run extra rich mixtures then you probably wouldn't need water injection. This was first used on air craft. I believe the first commercial use in cars was the 1962 Olds Jetfire. They called their water, soluble oil, antifreeze mix "Turbo Rocket Fluid". Customers are not enthusiasts and don't want to fool with the water. The manufacturers have gone to aftercoolers to cool the mixture which increases the lag due to volume increase and requires a blow through system. They have also gone to detonation sensors which retard the spark (and reduce power) to protect the engine. I regularly run 15 psi without detonation and have (not recommended) run as much as 30 psi ATM. using water inj. and a normal distributor spark advance curve i.e.. a 95 hp 4 sp. dist. The trouble with the turbo ign press retard is that with hopped up blower systems it is always retarded. MY system is a cheap iteration of the old Crown pony keg system using pirated boost to pressurize a water bottle and force water into the air cleaner. The onset is control by a metered leak of air into the air cleaner. I'm currently working on a system for naturally aspirated cars. The hold up is to find an affordable switch which senses falling vacuum.

Great explanation of the advantages of SafeGuard

My detailed comments are interspersed in your email. *All turbo lovers will love the safety from detonation, as well as the increase in power.[you can get rid of that power killing pressure retarder or just plug the line, and leave it there for looks*

While you can do that, why not take full advantage of the SafeGuard and switch the stock pressure retard for a vacuum advance unit. This will give you substantially better mileage AND better part throttle unboosted performance for any street driven turbo Corvair. Just be sure not to hook up the vacuum advance line DIRECTLY to the intake manifold. Either hook it to the vacuum advance port on the carb (plugged on the Carter YH) OR use a switch activated solenoid to give manifold vacuum to the vacuum advance unit ONLY as the throttle is opened from idle. This is the way the vacuum advance port in the carb is supposed to work, and will, once it is unplugged .For sure use the vacuum advance if you are going to a Safeguard system! The stock pressure retard was a major kludge because they had no ability to detect knock. In an era before electronics it did the job, but today a Safeguard renders that pretty primitive by comparison. If you don't want to do a Safeguard, at least use a Dale dual advance/retard distributor. Much better idea than the pressure retard only!

More on Safeguard:

There are two basic types of electronics systems. Open Loop and Closed Loop. An open loop system has no 'feedback' to the electronics. An open loop system may simply operate in relationship to engine vacuum. Like, for every 1 p.s.i of boost, retard the timing 2 degrees. Typical boost retard and water injection systems are open loop. They retard the timing based on boost pressure or inject the water based on engine vacuum. The electronics do not 'know' if the engine is pinging/knocking. Therefore the electronics can not determine if the engine requires less timing (more retard), more timing, or in the case of water injection, if the engine needs less water or more water. They just supply the water or 'retard' in proportion to the settings of the system. Two popular knock retard systems for performance cars are the MSD boost master and the Jacobs timing control. There are others, but the basic way in which they function are the same. These open loop systems are mainly designed to accommodate timing retard for turbocharged, supercharged and nitrous systems. They retard the base line timing [to all cylinders] in relationship to boost pressure. As stated they are open loop systems so they do not 'know' if the engine is pinging or not. They could be retarding the timing enough, or not enough or too much. Modern factory turbo and some exotic non-turbo cars have gone beyond simple open loop boost retard, and are sensing the onset of detonation with a knock sensor, and then electronically retarding the spark. This is called closed loop spark control. Technology has advanced to the point that microprocessors can now even figure out which cylinder is pinging, and then retard only that cylinder. This would allow each cylinder of the engine to be running at the highest efficiency possible. The '98 Corvette engine uses this principle. There are two closed loop knock retard systems available for our cars. The Carter unit (now manufactured by Caspro and Sold by Clarks') and the SafeGuard. Both systems use a detonation [knock] sensor which 'listens' to the engine and then retards the timing if the engine is knocking. Both units retard timing based on knock, but the mode in which they operate is completely different and thus their price point and the target market. The Caspro unit is an analog device which retards the timing to ALL cylinders based on the knock sensor's signal. That is its sole function. It has been on the market for a number of years and is a good product to help prevent detonation. The SafeGuard, on the other hand, is a fully digital device which is capable of retarding the timing to an individual cylinder based on the knock sensor's signal as well as other input. It operates in the same manner as the knock retard GM incorporates in the new C-5 Corvette. The SafeGuard also includes a high output ignition amplifier which significantly increases the coil's output, [62% more coil output than a G.M. HEI system] and an adjustable digital control sequence rev limiter. The Safeguard touts a higher degree of onboard intelligence with its added features and benefits thereby surpassing all knock retard units available today. How important is individual cylinder knock control? Dyno tests have shown that if the knock retard system uses knock (ping, detonation) as its only input, regardless of which cylinder is causing the knock then we can loose up to 15% of the engine's potential torque output. We want all the torque we can get. This loss of torque output is caused by the knock retard system retarding ALL the cylinders to eliminate the knock, not just the offending cylinder that is causing the knock. Real world testing has shown 15% to be a conservative number given the load conditions during actual driving. Remember the old adage to set your timing: "2 percent power loss below border line knock setting". What this effectively is doing is setting your timing to the cylinder that has the greatest tendency to knock. Not all cylinders are created equal, even in the same engine with matched chamber volumes and matched piston deck heights. This is because each cylinder will have slightly different operating temperatures and fuel mixtures. It is common knowledge that the center cylinders run hotter then the end cylinders. The left side of the engine runs hotter then the right side because of the oil cooler and the longer exhaust manifold. Fuel distribution on the Corvair is good, but not all cylinders are receiving the same mixture strength. Take your pick. Either the SafeGuard, the Caspro or what you have now.

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I already have a MSD unit will it need to be replaced? You will not need to replace any parts and none of the parts will cancel each other out. I would still run with the MSD because your are generating over 10 PSI of boost and you already have the MSD [g]. Warren LeVeque really likes the output of a GM HEI system and I believe he does not run any other ignition amplifier system. [Warren let us know] The SafeGuard will output 62% more to the coil than an GM HEI system, so in that case, it is more than plenty. The SafeGuard can be triggered from any source, points, aftermarket electronic points replacements or 'factory' electronic triggers. So, you can use your light trigger if you are happy with it. The SafeGuard will get the trigger signal from your light trigger and then trigger the MSD depending on the engine's timing needs. Think of it in this way, the SafeGuard simply installs between the trigger source and the 'device' that drives the coil. If there is no amplifier driving the coil, then the SafeGuard will drive the coil with it's built in H.O. ignition amplifier. Note: The pictures on the web site [www.american-pi.com] are pictures of the first generation SafeGuard. We have the second generation of the SafeGuard in production now. The first generation has served very will with over 2,000 units installed. Pictures should be up in a week or so of the new unit. Improvements to the new SafeGuard mainly deal with additional signal [trigger] lines to accommodate the different types of triggering devices that are being used, on board status indicators and [constantly] improved firmware. We also have a new case design of extruded aluminum which is polished and anodized. Even the logo is anodized, not screen painted.

3) Look at it this way, once you mash the skinny pedal to the floor the Dale advance/retard (A/R) unit goes to zero advance/zero retard. As boost build up it retards the timing to ALL cylinders at 'X' degrees for 'Y' psi of boost. The SafeGuard, on the other hand will only retard the cylinder(s) that need it, thus you have more advance to all cylinders and your engine is still not pinging. More advance gives greater cylinder pressure (within limits) and greater cylinder pressures gives more boost pressure. Given two of the same engines, individual cylinder retard nets a gain of at least 12% increase in torque output vs. all cylinder retard. With the SafeGuard installed you can run a standard vacuum advance pod, or you can still run with the Dale A/R unit. You will obtain more torque by not running the A/R and just running a advance pod. This is because the SafeGuard is controlling the timing to each cylinder based on what it needs (closed loop operation) and the A/R unit is an open loop device that is unaware if the engine is pinging or not. Note: I heartily suggest the Dale A/R unit for any turbo not running a SafeGuard. It does increase throttle response and fuel economy.

Safeguard additional:

The monitor output on the SafeGuard has been used to drive different devices such as a buzzer, light, turn on a water injection system or reduce the flow of N20.

For a turbo application you can run a typical water injection system without any interface to the SafeGuard. As soon as the water injection is activated under boost, the SafeGuard would automatically adjust to this and pull less timing out of the engine, if and as necessary. I don't think you would gain much in this application by interfacing the SafeGuard directly to the water injection system.

For example: You ran the SafeGuard with a high boost turbo engine and the SafeGuard showed that it needed to pull 14 degrees out of one or more cylinders to prevent detonation. Now you install a water injection system. The SafeGuard may now only show it needs to pull 8 degrees out of the timing to of one or more cylinders to prevent detonation under the same conditions. Since the water injection system is 'open loop' in reference to spark knock and the SafeGuard is 'closed loop' in reference to spark knock you would just need set up the water injection system close to the ideal. It does not have to be 'right on' adjustment wise as the SafeGuard will automatically fill in the dead holes as required. The SafeGuard would adjust the timing to prevent detonation and the water injection would serve to help in the manner of allowing the SafeGuard not to need to pull more timing out.

You could also tune the SafeGuard to the water injection system or vice a versa. With the adjustable MAP sensor timing control on the SafeGuard, you could adjust the boost timing preemptively. For example, if you know that your water injection system was set to start the flow of water at 3 psi and the SafeGuard monitor showed it was retarding the timing 6 degrees at 3 psi you would set the boost retard at 2 psi with a rate of 2 degrees per psi. So, at 3 psi the SafeGuard would already have the timing backed off the 6 degrees.

Keith Black Turbo pistons:

I cced the pistons from Lon. The flat top with valve reliefs;; The reliefs are 5 cc total. The bowl in the turbo piston is 20 cc. You can figure your situation. Roughly, with the bowl and stock turbo heads the CR will be 6.8 /1 with stock 140 heads the CR will be 7.6/1.

More: I just recently purchased a 180 long block and I was going to use it as the basis for my rebuild. I was told to use the 65 95hp heads and modify to increase the squish area. .**Q-** What do you recommend? Increase the squish area? **A-** That is not possible unless you weld additional material to the combustion chamber. I believe you want to mill the gasket register to decrease the gap between the piston at TDC and the squish area in the head. Replace anything that shows signs of wear or replace the stock parts with better quality parts for your intended application. Be especially note full of the crankshaft gear as a worn crankshaft gear will take out a new cam gear in short order.

Q- What about stock distributor Vs safeguard? **A-** That is no comparison between the individual cylinder control that the SafeGuard has to offer and the stock distributor. But that is not the point. You need to consider if you require the features and benefits of the SafeGuard and this depends on many factors. Once you get all the detail of your engine together, then you can start looking at your other options for spark timing control.

Turbo engine-1

If you plot the horsepower and torque curves that Chevy published in the information package they send upon request, you'll find there is very little difference between all of the Corvair engines below 2200 rpm. The 140 hp engine has slightly more torque than the other three (95, 110, 180) engines at 1400 rpm -- about 10 LB-ft or 8% more (140 LB-ft at 1400 rpm Vs 130 lb-ft for the others), but then they all converge at about 2000. It's only once you get above 3400 that it's clear that the 140 has more torque than the 110.

Once you hit about 2400 rpm, then it's whole 'nuther story. The turbo comes into its own and its torque (and subsequent horsepower) curve starts climbing and leaves the other engines in the dust. (I know this doesn't take into account either throttle response or the time it takes to heat the exhaust system up so the "waste" heat can be utilized by the turbo. And this is an important consideration for the "feel" of the car.)

The big advantage the 140 has over the 95 and 110 is its ability to breathe. This is clearly shown by the torque and hp curves -- the 95 torque curve starts dropping at about

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2400 rpm, the 110 at 2800, and the 140 hangs in there to peak at 3600 and doesn't really start dropping till about 4500 rpm. (Horsepower is calculated from the torque curve -- (rpm x torque) / 5252. Therefore since the torque is only falling off slowly, the hp keeps going up as rpm increases until the torque curve really starts dropping.)

The turbocharger makes up for a lot of the turbo head's small valves and generally restricted intake. It's torque curve peaks at 3200 rpm (265 lb-ft versus about 160 lb-ft) and the curve looks as if it is dropping fairly quickly, but it has so much more torque to begin with that its torque and hp curves stay well above all the other engines out to at least 5000 rpm. (I don't have data points above 4600 rpm for the turbo engine -- Chevy didn't report the data once they established the drop-off after the hp peak was reached.)

Bottom line is that it's basically a myth that a 95 or 110 hp engine has more low end torque -- the 140 has the most, but only slightly, and only over a part of the low-rpm range. All four engines plot along about the same curve, almost on top of one another. The 95, 110, and 140 all show the classic torque and hp curves you would expect for improved breathing -- the torque curves start dropping at progressively higher rpm's and consequently each engine generates more peak power at a higher rpm. The turbo engine curve is highly skewed by the turbo. It is the same as the other engines till the turbo spools up -- then it flies!

(It would be interesting to put four otherwise identical Corvairs side by side, running in fourth gear at say 15 mph -- 750 rpm w/ 3.55 gears -- and then floor all four at the same time. They should each accelerate as their torque & hp curves show. All four should stay about side by side till 45 mph then the turbo would start its move. The 95 would start to fall behind the 110 at about 50 mph and the 110 would start to seriously lag the 140 at 70 mph. This might be an interesting experiment for some CORSA convention.)

P.S. Adding a combination vacuum advance/pressure retard unit to a turbo doesn't change its full throttle performance. The zero vacuum timing is set the same as with a pure pressure retard unit, so there is no net change in timing at full throttle (no vacuum) until boost starts. The extra vacuum advance under part throttle conditions does make it a bit more "lively" by improving throttle response and does add a bit to the fuel economy by increasing the part throttle timing advance.

Engine timing for all four engines are very different. The non-turbo engines have much more aggressive centrifugal advances than the turbo, all starting below 1000 rpm, as compared with the turbo distributor which doesn't start until it's reached 4000 rpm. The 95 & 110 ramp up to 34 degrees total advance (static plus centrifugal), the 140 goes to 36 degrees at 2800 rpm. The turbo, by contrast, is statically timed at 24 degrees advance so it has more advance than the other engines until their centrifugal advances catch up. With full centrifugal advance, the turbo distributor gets to about 30 degrees with the pressure retard in operation. (The static plus centrifugal timing would be 38 degrees, but the retard unit cuts it back by 8 degrees.)

Stock Turbo :

The problem with the stock turbo setup (which I notice you no longer have) is the low CR and lack of vacuum advance makes the turbo car feel very sluggish in part throttle typical street driving. Also, I'm not convinced that a FIXED timing advance (24 degrees) from idle to 4000 rpm (without boost) is optimum for part throttle performance. Look at the wide variation in timing for the other 3 Corvair engines without turbos. IMHO, the addition of vacuum advance makes the engine feel a LOT more lively in street driving (not FULL THROTTLE) as well as significantly increasing gas mileage. When I added vacuum advance, my 180 mileage on the same trip everyday back and forth to work went from 18 mpg to 22 mpg, an increase of 22%, surely more than "a bit" in anybody's vocabulary. Granted, if you can drive to work at full throttle, you'll see NO improvement in gas mileage.

Turbo dist:

I found that over 15psi I couldn't prevent misfire with anything but a GM HEI unit and a big Accel coil. I set the total at 32 degrees. That makes the initial about 10 deg. which makes it start easy. Not very technical, huh? My street Spyder has the perlux system and a disabled press. retard. It still misses around 15 psi.

Turbo Porting:

Porting and Polishing... You are running a turbo therefore do not...repeat DO NOT polish the intake and exhaust ports. On turbocharged vehicles the pressurized system benefits from the roughness of the port walls in keeping the air/gasoline mix atomized. You need an atomized mixture for good combustion. You can however polish the combustion chamber, valves on the combustion chamber side and piston tops. This reduces carbon build up and makes cleaning the chambers easier the next time you service the motor. It also helps to reduce the heat transfer to these parts. You can do minor porting on a turbocharged engine to allow the ports to work properly and remove the manufacturing flaws. Your porting should be restricted to removing the excess material around the exhaust and intake port valve guides and cleaning up the area directly under the valve seat. (Do not undercut in the port are below the valve seat). If there are blobs of metal in the ports where material has filled in or restricted part of the port then you can remove these as well, however on a turbo engine porting like a normally aspirated engine is a waste of time and hurts performance. While you are doing porting work don't nick, cut or damage the valve seat or valve guide either internally or externally. A damaged valve seat requires major work if not replacement to seal the valves. A damaged valve guide is a weak spot for valve guide failure by fracture to start from. (A broken valve guide can do more damage than a dropped valve seat. Don't ask how I know). If your going to do some modest porting on a turbo then the following are recommended. Use machinist's blue or a black or blue felt pen to mark all of the valve seat and the valve guide so that if you do hit them you know you have. Some people like covering this with masking tape but I have found it only makes it more likely to damage these critical surfaces. also blue the head gasket area as a precaution. Before you start, buy and use safety glasses AND a full faceshield. You will be dealing with speeds of cutters at over 20,000 rpm. Aluminum cuttings hurt at this speed and eye damage is not repairable. Wear at least a paper filter particle mask and have an industrial or shop vac on and set up to vacuum up the bits while working. Ear plugs or muffs are also a good idea due to the noise of the die grinder and the cutter. Make sure you have good light and a support for the cylinder head your working on. You can (and I have) used an electric drill with a normal high speed steel burr to port aluminum however its a lot of work, wears the drill motor bushings out and takes too long. The next step up is to go to Sears and buy their rotary die grinder ($89.99 Canadian so less in the USA) and some carbide burrs for aluminum. The Sears grinder is

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the cheapest I know of however again while better than the electric drill it is poorly balanced in you hand. Remember that we don't want to damage the valve seat and the valve guide and therefore the balance of the tool is critical to doing a good job. (Just so you know I also wore out one the Sears units years ago). The best solution is an real industrial die grinder like the Thor shown on page 34 of How to Hot Rod Corvairs. (the Sears is similar in overall design). I have a Dumore (much like the Thor) which is very nicely balanced and has been used so much that I have had new bearings installed in it from so much use. This Dumore has paid for itself because of the inexpensive rebuild the balance and the cooler running of the motor. Even so the Dumore still gets hot enough I have to stop and let it cool for a couple of hours. Dumore is also the tool of choice in the tool and die or moldmaking industries. You can also get attachments for the Dumore that allow the use of a flexible shaft from your Dumore to the cutting burr. This uses a stand to support the motor of the Dumore (more balance less hand strain). While I don't have these flexible shaft attachments you can understand what they look like by viewing a Deluxe full feature Dremel kit and thinking bigger more industrial strength. Dremels are nice but not up to the strength needed for head work. The flexible shaft makes the risk of damage to the valve seat and guide less, reduces strain on the hands and allows cooler running of the motor so it has benefits. You need real carbide aluminum burrs in 1/4 inch shaft size and varying shapes for doing porting work. Aluminum Carbide burrs have larger pitches (fewer cutting flutes) than those for cast iron. I find elliptical, oval and ball shaped cutters to be the best for Corvair work. Aluminum will "ballup" in the flutes of the cutter unless you lubricate the cutter regularly. The best is a tube of "grinders grease" specially designed for this use. Next try WD40 or oil as a lube (but more often than grinders grease). Or there's the home brew recipe of a bar of Ivory soap, just fill the flutes full of soap and cut away for a while then refill the flutes with Ivory. The exhaust port guide boss on the turbo is the most significant place to port. The results here will be some performance and reduced heat load in the engine. This heat is one of the performance killers in the factory turbo engine. Hold the die grinder with two hands such that the hand closest to the port is used to lightly move the cutter end around where you want to do the cutting. Think of this light movement as little more than pushing a pencil around to do art work. Work slowly thinking of what your doing as art work on and industrial scale. Don't let the cutter, cutter shaft or the collet of the die grinder mark the valve seat or the valve guide (remember that bluing). Lay back the aluminum of the exhaust port guide so that there is a clearer flow out the exhaust from the most restricted side of the valve. We are trying here to remove as much of the aluminum around the guide as possible without weakening the guide support the aluminum gives. We also want the original shape of the exhaust port as if the guide were not there. This of course is impossible but we want the best compromise possible for flow out of the exhaust. Remember work slowly and patiently. On the intake side we want much the same work done but thinking the flow into the combustion chamber and not out of it. Remove only enough material to allow better flow around the valve guide into the combustion chamber. Work on the intake side of a turbo will not bring significant performance so keep that in mind. For flow bench ideas see Richard Finch's idea of a garden hose and bucket for checking and matching the flow between ports. You must match the shape and as best as possible the flow from exhaust port to exhaust port etc. Remember work slowly and master the art. Do the work on you valve guides and the valve job after the other head work is completed.

Competition Turbo Engines :

Turbo charged engines can work well in autocrosses if very well developed and if the characteristics are understood. Al of the sanctioning bodies require a single turbo in the stock location, so that is what we will discuss. While I agree with the theories of why a “blow-through” system should be better, I could not find any discernible performance difference in practice. My system had all of the features: flow back loops, compressor butterfly, and vent whistles. The response may be theoretically better, but it is minor compared to lag in all systems. Without building a fire in the exhaust housing there is no “ no-lag” system. The lag or “horsepower change is always there to some degree, the driver’s internal computer just adapts.

To match a 180 to 200 hp naturally aspirated autocross engine, a Turbo must have at least 250 to 275 hp to have an average of 180 to 200 hp over the course. Most tight turns are exited with about 100 hp and the peak of up to 300 hp is reached upon braking for the next turn. Driver-wise the Turbo requires much more attention. Reducing lag and total commitment to a turn is the name of the game. Backing out of the throttle for mid-turn adjustments is self defeating. When you get off of the throttle, you have to start over developing boost. However, once you’re used to it , you’re addicted.

Preparation wise Turbos are great. the base engine is best absolutely stock, but must be in perfect condition. There is no milling, no race cams, no expensive rocker arms or pushrod geometry changes, no intake manifolds or headers. Just balance the rods, use good rings and pistons. Use oil pan and push rod tube baffling and all of the additional crankcase baffling that you can manage. You are stuffing 2 atmospheres into a 1 atmosphere case. Stock intake manifolds are best due to the small volume. There can be NO exhaust leaks. Check the vertical pipe often. Usually no muffler at all is needed. The cooling system must be stock and perfect.

High rpms aren’t necessary or desired except to avoid a shift. Shift up at 5000 rpm and LOAD the engine, that’s how boost is made. 140 hp heads make slightly better response, no more boost and failures easily offset any gains. 95 hp heads with turbo valves and guides relieves some detonation tendency.

The power is all bolted on. Use a large compressor, a small exhaust turbine, and a large variable carburetor . Your turbo engine will vary from 300 to 600 cfm.

A throttle body with a feed back loop will work. A good inexpensive combination is an early model exh. turbine and a late model compressor with a large carburetor- this will double the stock boost to about 18 psi gauge. The stock boost control IS the carburetor. Even with a Crown scroll and an E flow compressor, the stock carb limit is about 10 psi and goes dead rich at the top, limiting rpm. Other wise the E flow and Crown can produce 30 psi and over 300 hp. 15 psi is a practical limit and requires a large element waste gate to control it. If using a small Weber (40 DCOE) good response can be obtained by using 26 mm chokes(venturies) however boost is limited to 10 to 12 and goes rich at high rpms. A 2” SU or a Predator should give good response and power. A large (45 DCOE) can be made progressive using large chokes to get both response and power. A good cheap alternative is a small Rochester Q-Jet.

If running a Turbo, the Corvair is probably the best possible car to do it in. The long wheel base, large polar moment, and excellent traction mitigates the large horsepower changes which occur. If you are fast in your Turbo, your lines will be different than most. Pay attention to timers, not critics.

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If you are running 15 psi or more boost, then you are going to have ignition problems-missing out or backfiring. The stock ignition system does well if absolutely perfect. I have tried most of the after marker ignition systems. They all work well at high rpms but not high boost. I can only suppose that it is a matter of ignition current not voltage. The Perlux works right up to 15 psi. The GM HEI system seems to be only one to go above that. Use a 95 hp manual trans distributor with a full advance of 32 degrees, with a high output coil. Use Mag Wire type plug wires and platinum plugs gapped at .022. The only problem with the Turbo distributor is that at these boost levels, it will be retarded all of the time.

Detonation must be guarded against. Water injection works well on the street where detonation ca be listened for. A simple system can be made from a RV water pump, a pressure sensor, and copper tubing with a .030" orifice. An even simpler system can be made by bleeding off some boost and pressuring an injection bottle. Inject about 3 or 4 psi before detonation starts. When injecting too much water, miss out similar to over richness occurs. Use race fuel when racing-you won't hear detonation when excited. There are several useful electronic products available such as ignition retard system and knock sensors or eliminators which work well. Remember retard equals power loss. You can pirate some water injection to spray into the cooling system if needed. Also, a huge oil cooler helps if racing.

Intercoolers do produce more power before detonation but significantly increase lag in an autocross. Also they do not work well with draw -through systems as they are cooling a gas/air mixture. Use rich mixtures and water injection as your intercooler. A disadvantage to a turbocharged car is that once experienced , you can't go back.

Turbo pistons:

If you are getting pinging now you need one. expensive but worth it. 1 engine or head rebuild will pay for it. it will retard the timing on the cylinder that is doing the pinging. btw at 13# of boost your taking your chances with the stock pistons. TRW's are good for 15/16# boost but above that I'd suggest those that are pin drilled rather than a slot like TRW's. First off, you need a wastegate to prevent overboosting. 13psi is a lot for a Vair, and detonation is a certain killer. I run a Safeguard, and it is worth it's weight in gold. It will not solve problems outside it's parameters. I run a blow-through car, that has no carb in front of the turbo, so I know about lots of boost. I run a deltagate from Turbonetics[cost-$210] The water-injection will provide some intercooling, but with even premium 92-3 gas, detonation is a problem at 13psi. More Octane is your next bet, as you cannot use an intercooler with a draw-through design. I would install a wastegate and use a regulator to help find the best setting for your: Elevation, jetting, Spark-advance, water-injection etc. That way, your boost will be consistent, and controllable.

Wastegate mounting:

Mounting a wastegate on a late takes some careful planning, as to position. Mount it on the crossover ONLY! and make sure the exhaust path is gentle to flow. I TIG weld the Deltagate flange just to the right of the crossover[on the pass side of course] on a fairly even plane with the crossover. Do some positioning and tack weld first before sealing up. I run a short pipe from the exit port and out. I position the gate, so it fires directly out the back. Space is tight, so be careful. On an early car, there is more room, so more freedom. I ***limit*** my "everyday" boost to 9-10psi, and occasionally use 12-13 MAX at events or for occasional embarrassment of Crustangs<g> Most guys talk about the pistons and rings, and I agree, and add to that con-rod bearings damaged by detonation pressures. Going over 10psi in 80+ ambient requires high octane and water-injection or intercooler[blow-through only] Detonation is the biggest enemy by far..... Dave Binnie

(Turbonetics Deltagate wastegates)

Best pistons for Turbo:

As stated, Forged or Hypereutectic pistons would be strong enough, given they have drilled oil land holes. The weak spot in a TRW forged piston is the oil land which is slotted through the piston. This cuts the piston almost in half and makes it prone to collapsing the oil land during high boost pressures or detonation. For the most part you will probably have to order a set of custom forged pistons. Clark's stated that they will release a 'superior' piston latter this year that may fit your need, but I don't know since I have not seen one to see what they are. From the description, it seems like a hypereutectic piston, but I can't say. Detonation is a killer because detonation raises peak cylinders pressures. During detonation the cylinder pressures are almost twice as high as during normal operating conditions. Now, add a forced induction system which raises cylinder pressures also, and you quickly see how you can make expensive scrap out of nice parts in just a blink of an eye. So, do all you can to make sure your engine will not detonate, use strong pistons with drilled oil lands and keep boost to a livable limit

Turbo muffler:

I am using a Pacesetter Resonator tip, w no muffler, on my Turbo Corsa. It is reasonably quiet (thanks to the inherent muffling of the turbo), and frequently gets mistaken for a "cammed" smallblock when it's idling <G>! Don't know that it makes more HP, but it's light, sounds good, looks good (the yellow hi-lights match my stripes) and was CHEAP: $30.00 from Summit, and $5 at the local muffler shop to bend a pipe!

High Boost:

The combination of a Q-jet, late compressor and early exhaust will net you TONS of boost. I had the pleasure of tuning a combination like this, but had a late Crown exhaust housing. The early housing will give similar results. With the Q-Jet secondary air vane limited to 1/2 opening, the engine would peg the VOID boost gauge (15 PSI) in mid second gear. When the engine was nice and hot, your would get 15 PSI in the top of first gear. I estimate the engine would pull 20 to 25 PSI. With a SafeGuard installed it was pulling the timing back 20 degrees to suppress detonation. With water injection installed timing would be pulled back 12 to 15 degrees. Water injection is a must, you also may have to electronic knock control.

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Turbo Bearings: *If you run synthetic oil, turbo's rarely coke*

Turbo clearances:

To get a measurement I assembled the unit with the gasket, minus the clamp. Then I took a visual guess at the space between the gasket and the surface, which the clamp would remove. I then placed three pieces of equal shim stock, equally spaced, around the diameter unit (experiment). When all three were just snug, this should now equal how much the heat shield should back off when the spring is compressed by the clamp. Once before I just cleaned and inspected the turbine and housing and found I needed a shim for the wheel to turn. This time I pulled the whole thing apart for seals. There was a carbon build on the shield and back of the turbine. When this was cleaned up I found I had clearance without the shim installed and was curious as to how much.

On the compressor side I always end up at the fat end or just past the .015 to .020 spec. We have shims at work just like the turbine shims, they are in .001, .003 and .005. I use the shop manual method which gets me to about .021 with the stock .010 and .015 that is available. Now without the carbon seal or piston ring installed, I add a couple of thousandths at a time the torque the housing with the gasket. I then slowly turn the exhaust wheel while pushing it toward the compressor side (to remove end play). I repeat this, adding shims until the compressor wheel just touches at the tightest spot. I then remove .013 of the extra shims, which is now my clearance. I then install the carbon seal and piston ring and assemble the unit. This gives me about .008 tighter than I can normally get on my particular unit. I get quicker spooling and another pound on the gauge. This is a close to stock,

YH engine setup. I don't think it would matter as much with a larger carb and waste gate set up. I don't recommend this to anyone who does not have patience. This is the last place you want metal contact. Has anyone out there run at less than .013 compressor clearance? I would like to know what is safe?

Adjusting Dale retard Dist:

There are 2 holes in the Dale A/R where the screws hold it to the side of the distributor. If you loosen the screws the A/R may move clockwise. If the holes are not elongated you will have to file them out. Basically what Dale said was, you can move it far enough so that breaker plate arm (the one with the little pin), hits the edge of the little 5/8" notch in the breaker plate base and limits the total movement. I don't know what your skill level is, but please is careful when doing this. Detonation under full boost is dangerous and will make your pinging seem like a picnic. You need to pressurize the retard with 10 psi, then see where the timing is, note, this will almost stall your engine, your may have to increase the idle speed. If you don't have a compressor maybe you could use a tire with 10 psi in it as a source. If you check the shop manual or HTHRCE, you will see that full retard without any centrifugal advance should be at 12 to 14 BTDC. (For a stock 180) 12 is a good place to start. I hooked up my hand vacuum pump the A/R line. Its starts to advance at between 1 and 2 inches, at three inches I have 4 additional degrees of advance. I hooked up my big vacuum gauge (dash is accurate, but too small look at a couple inches) via a long tube so I can monitor the vacuum where the pinging usually occurs. In high gear at 2500 I floored it. The vacuum dropped very quickly to 4 or 5, then slowed a little between that point and zero. (Trying to watch the road and the gauge) This is where my pinging usually occurs. You may want to try this on yours if you have a slightly different CID/carb/Turbo relationship. Anyway I guess this is why they recommend starting at 18 degrees with the Dale unit, you really have something more than that when driving. Here's how I set mine up. Start at 18 and check for pinging (hopefully none) then advance it 1 degree at a time until it pings. Then back it off 1 degree. Now calculate the difference between that point and 16 degrees (for EMs), 12 for LM, which is where the timing should be at full boost. If it happens to be 20 then limit your retard to 4, or say 21 then 21-5=16. After you move the A/R CW to limit the retard, you have also retarded your timing, you will have to turn the distributor CCW again. Then double check the retard again to make certain you are going from the initial point, that did not ping, back to 16 (EM),12 (LM 180). This way you will run between the correct 12(LM)/16 (EM) at full boost under 4000 RPM and to 28 degrees @ 4500 RPM. Remember, all I am doing here is getting the timing curve under boost, to were the GM plotted it, not modify it.

Turbo setup High boost recommendations:

My suggestion for a hot setup for your turbo given the above, would be as follows: Boost output around 15 psi - Dale rebuilt distributor with GM or Chrysler Mag pickup to replace the points. A SafeGuard individual cylinder control ignition system triggered directly from the Mag pickup. Use a GM style HEI coil and Seth's wires. Boost output over 16 psi - Maybe consider a 'small' HEI distributor conversion. If you need more ignition output, install a MSD. Note: We have run Corvairs with 20 psi boost with Dale rebuilt distributors and a SafeGuard to fire it all. No misfires. Ray Sedman Also recommended, If your worried about cool down time get a accumulator system. it will run oil through the turbo for approx. 5 minutes after the engine is off. assume your going to run synthetic oil? it's cheap compared to the cost of the engine. btw TRW pistons are good only for 15# of boost. anything more and you will need pin drilled pistons. you will need a external oil cooler along with Otto’s pan, baffle spacer, hi vol. oil pump, oilstat, just to get started.

Turbo Rebuild:

There are some tricks and secrets that you should know about when you take a turbo apart for service. First of all, the turbine will not turn freely when the intake housing is removed due to a large preload spring. With the unit fully assembled, the turbine will turn, but not spin. It is rather difficult to describe the exact feel without actually experiencing how a proper turbine should rotate. The turbine will not "spin" by hand. It will rotate with a slight amount of resistance and stop as soon as you stop turning it. It feels almost like it isn't just quite right, or at least you may feel that there is a slight drag, well that's normal. As for oil use, is the oil going out the exhaust or is it getting into the intake side of the turbo; it makes a big difference on whether you replace the carbon seal or not. I don't think that Clarks "poor man" kit contains this seal, though I may be wrong.

The impeller is held on the turbine shaft with a left-hand thread. Installing the small piston ring is a real trick. The shop manual has a procedure that you could use or use the self destructing sleeve that Clark sells.

More on rebuild

Axial free play (end play) on the Turbo should be between 0.005" to 0.008" Radial Play (Side to side) should be 0.022" maximum. To measure clearances with your dial indicator you will most likely need a 'universal clamp kit'. The common magnetic base stands will not be very useful to you. The idea is to clamp the dial indicator on the Turbo and measure what you need as follows.

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To measure end play you would clamp the dial indicator on the bearing housing such that the indicator point is contacting the impeller nut and is straight inline with the turbine shaft. The dial indicator needs to be 'loaded'. All this means is you contact the indicator point against the surface to be measured such that the indicator point will move the dial pointer. It does not matter 'how' much it moves, it, just that the dial indicator is not 'at rest'. Now tighten all of the clamping devices which hold the dial indicator to the bearing housing.

Now loosen the dial indicator bezel (face) lock, if used, and rotate the bezel so 'Zero' lines up with the dial pointer. Press down on the bearing housing and you will see the dial indicator pointer move. Note the sweep of the pointer. This is your end play.

The same follows to measure radial play, but you would set the dial indicator to rest 90 degrees from the turbine shaft. Load the shaft against the dial indicator and take a few readings. Repeat at 90 degrees to take a cross reading. The shop manual has some good pictures that should help in the above explanation.

Safeguard:

There are a few different 'anti-knock' systems out there. Let us just call them 'closed loop' and 'open loop'. An open loop system is one that has no 'feed back' from the engine. The MSD boost retard is typical of this type of system. You set the knob and the unit will retard your timing based on boost only. If you set the knob to '2', for every 2 psi the unit will retard your timing 2 degrees, etc. An open loop system never 'knows' that your engine is knocking - it retards the timing only during boost and only to what you set it at.

A closed loop system gets 'feed back' from the engine. When the engine starts to knock, the unit retards the timing. The Carter/Caspro and the SafeGuard operate in such a manner. The Carter/Caspro unit will retard all your cylinders based on knock; it retards your baseline timing. In such a manner you are retarding your engine based on, for example, one cylinder which has a lower threshold towards knock. The SafeGuard, on the other hand, has the ability to retard only the cylinder(s) which are knocking. In doing such, the SafeGuard keeps track of every cylinder and adjusts the timing to EACH and EVERY cylinder. It does not retard all cylinders the same amount - only the amount which is needed. The SafeGuard is the only [non-OEM] system on the market which controls individual cylinders. Testing has shown that this individual cylinder control can increase engine torque up to 12% over retarding your baseline timing. This will also allow your engine to run at a lower temperature than running retarded.

Both the Carter/Caspro and the SafeGuard are effective means to control knock. As you might expect, the SafeGuard commands a higher price tag than the Carter/Caspro.

But, before you invest in any system, you may want to 'fatten up' your mixture - jet your YH richer. You mentioned that the engine knocks at 2200-2600 r.p.m. The YH does have a 'habit' of running lean during the transition from light cruise to power. This is the r.p.m range that you noted. I would think if you put an EGA [exhaust gas analyzer] on your car you would find a lean 'hole' at that r.p.m. This lean hole may be your problem. Just for a test, open up your main jet +0.10 mm [approx. .004"] and see how it runs.

Water Injection :

MacInnes, for whatever reason, doesn't cite the later Army Air Force research from during WWII that explored the detonation inhibiting characteristics of various mixtures of water and ethanol, and finally settled on the proportion I have mentioned somewhere before. The carburetors used on airplane engines equipped for this sort of war-emergency power boost had water injection systems plumbed in which leaned out the fuel mixture when activated in order to use the combustion benefit of the ethanol in the mixture. The ethanol appears to have acted as an intake air coolant and combustion modifier. It was also useful as an antifreeze in cold climates for both the water injection system and
the maintenance crews.

In all these cases, the excess fuel or addition of water simply reduces the rate of rise of cylinder pressure. It is the high rate of pressure rise at the onset of combustion which seems to cause all the direst effects of second flamefront ignition and detonation. In the conditions that Ricardo cites, the extra mass of fuel or water has to be vaporized before the cylinder pressure can climb quickly--it acts as a thermal mass, or ballast. Since water is so much denser than fuel, and since it has such a great heat of vaporization, it is a good choice for this sort of thing.

More on water Injection:

The only increase in power will come about if:
1) you are enabled to run more spark advance (or less retard) than you have now without detonation or
2) you can run more boost (not applicable with your normally aspirated engine) before detonation.or
3) you can modify the heads / pistons to provide a higher compression ratio before detonation or
4) some combination or all of the above note that the trend here is preventing detonation...
I used to use water injection in my Corsa 140 when "premium" meant 91 unleaded, but haven't needed to now that 93 and 94 are widely available.

Difference between 140 vs turbo:

OK. At low speeds (i.e. legal speeds), the 140 should run hotter than the turbo because the 140 has higher compression and (supposedly) fewer cooling fins on the heads (because more room was needed for the bigger diameter valves... again supposedly. I can't confirm this). The turbo, at low speeds (i.e. under 3000 rpm) runs much like a 95hp engine because it has 8:1 compression ratio. When I say run hotter, I mean temp at the head.

The turbo motor, on the other hand, has an exhaust pipe that climbs into the engine compartment to feed the drive-side of the turbo impeller, so the engine compartment gets additional heat that the 140 doesn't experience. I suspect that *overall* this would even things out temp wise between the 140 and the turbo motor. The 140 gets extra heat from greater compression and fewer cooling fins, while the turbo gets the extra heat from having an extra heat source inside the engine compartment.

The 140, especially the 140 PG motor, produces better torque under 3000 to 3200 rpm, so the legal-speed driveability will be better than the turbo, which should behave much like a 95hp engine. Once you "step-on-it" in a turbo however, things change

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dramatically. The turbo gets into the boost range where the turbo actually force-feeds mixture into the engine. The torque generated by a turbo engine in boost runs from 210 ft-lbs to 232 ft-lbs (gross measurement) in contrast to around 160 ft-lbs for all non-turbo 164 cid engines. This means the turbo will out run any Corvair by a considerable margin once the boost comes in. You won't see a huge difference in the acceleration figures from 0-60 mph or even in the 1/4 mile between a 180 and a 140 because these events are spend more time under 60 to 70 mph where the turbo isn't into the boost range. The turbo starts to boost above 3000 rpm (and say 65 mph) so it starts to make up for its lower-speed disadvantage. If a 60-90 acceleration test were run, the 150 and 180 hp engines would blow-away any 140 Corvair, easily. Turbo Corvairs should also have much higher top speeds than the 140 but the combined (and intentional) exhaust backpressure and small valves prevent it. Chevy knew that the turbos would develop much more heat than they can get rid of when they are driven in boost for any substantial period.... which leads to oil failure and engine meltdown short thereafter. So the engine was deliberately strangled at high speeds, to reduce the chance that the driver will go any faster for any great length of time (say more than a minute).

OK, so much for differences. Care and feeding? If I had a turbo, I would *absolutely* use a synthetic oil (Mobil-1 e.g.) because it runs cleaner and will work under higher temps (this is *crucial* for turbo bearing lube and cooling). If I had a 140, I would probably *still* use a synthetic oil, but with an oil change every 3000 miles, the synthetic
probably provides unnecessary insurance. For both engines, I would be positively anal about keeping the oil cooler fins clean and free of leaves/twigs etc. The lower hp engines run much cooler and so you wouldn't need to be as fussy.

If I had a turbo, I might also seriously consider adding water injection. There are several reasons to add water injection to any engine, but the best one for the turbo is to reduce the tendency to detonate when the engine is in the boost range. I think a few of our "blown" Virtual members [sidebar: subtle bad humor here] have H20 injection on their 150 and 180 engines.

2) A 180 will run very well for many miles performing like a 95. However if you run it in that fashion you will be disappointed on the rare occasion when you push the pedal to the metal and expect it to perform. I have pulled apart many turbos that have carbon clogging the exhaust impeller and passages. This causes problems that continue to grow with time.

A 180 needs to be run so that the turbo kicks in, Clarks made the statement that they have driven many turbo Corvairs and have never driven one that gets boost in low gear. From my experience if the turbo is in good shape and hot enough it will come on strong in every gear. Once it has built up crud from lack of heat and slow driving it is lucky if you can see boost in any gear.

The down side is the maintenance required to keep a turbo running strong and the extra items that are needed to keep it intact. Water injection is a must today along with synthetic oil. It is also advisable to add an after market electric pump that will continue to circulate oil for several minutes after you shut off the engine.

3). The debate rages. In my opinion, both motors have there strength & weaknesses. After the smoke clears, I'd rather have the turbo, but with some misgivings. The 95 motor is the best, but that's not the issue. For showmanship, both the 140 & 180 are impressive,

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ESPECIALLY the turbo; for performance, the turbo's kick in the pants can't be beat--and that exhaust note!! However, the reputation of the Carter YH carb is notorious. I wrote an article years ago (back in the '70's) on how easy to repair and wonderful that beast was. Well, the ensuing years have proved me wrong. I've never seen a carb that can be so aggravating. When they work, they seem to be great and perform fine, but often when things ain't quite right, they DEFY troubleshooting. One weak link on this carb is the choke coil. I'm not sure if they're still available.

As for the turbo, if it isn't rebuilt or "known to be good", open it up and go through it. You can't take one out of a flea market and bolt it up. If the turbine's blades are bent, chipped, or broken, toss it, balance is critical. Don't forget the turbine nut's a left hand thread. Exhaust parts are getting hard to come by and are expensive.

As for synthetic oil, I don't use it. Today's oils are FAR superior to the oils of yesterday that I don't think synthetics are necessary for my application. My .02. Then again, what are you going to do with the turbo? Constantly push it? The two turbo's I have are show cars that are only driven occasionally, so that’s my viewpoint. Water injection may not be a bad idea if you keep your foot in it 'cause even with 93 octane, that thing can rattle with full boost and correct timing.

As for 140's, the problems generally associated with them are greater tendency to drop valve seats, secondaries gumming up, stupid (66 & later) secondary linkage, and a somewhat difficult time changing the center plugs. I have two of these and they are trouble-free (within reason).

Turbo reassembly :

1) How stiff should the turbine be? My rough calculation says that is takes about 1-2 inch lbs. to turn it. Is this normal ? It turns smoothly - it just takes a little more oomph than I would have thought.

Some 'drag' is normal, on a rebuild, but there should not be any 'rubbing'. You said it turns smoothly, that is good. It is hard to say...I do not have a good grasp on 1-2 in/lbs. of force. The turbo will not spin 'like a top'. You may be able to get one full revolution out of it with a good 'flick' of your finger.

2) How do you orient the central bearing housing with the exhaust housing ? One turns within the other and there are no dowels or pins to locate them(unlike the compressor housing).

Bolt it up to the car line up the intake hose and then tighten the "V" clamp. <g>. Before I take them apart, I place 'match' marks on both sides, this way you can line them up again. I have seen some with notches on both sides; I do not know if this is factory. A good rule of thumb is to set the exhaust housing down (the 4 bolt flanged surface) on a flat surface. Rotate the bearing housing until the oil drain outlet is about 30 degrees from perpendicular to the flat surface. That should be you close enough. Do not torque the "V" clamp. You need to align everything up when the assembly is on the car, then torque the "V" clamp.

Turbo exhaust pipes:

My apologies; you were correct in saying that 310 stainless steel would be the best choice for INSULATED (wrapped) exhaust piping used on the 180 turbo Corvairs. This time I checked with the chief metallurgist and he stated that with lower temperatures in the unboosted cars and exposure to the road salt, 409 was indicated. But with the much higher temps due to the combination of insulation and boosted operation, 310 would definitely be the choice. Maybe the wrapping and sealing with heavy aluminum (or better) would keep down the exposure to road salt.

Since wrapping the stock steel pipes causes them to disintegrate after a few months (usually just when you're trying to impress the driver of a much newer car) the use of 310 seems to be the way to go.

(65 Turbo exhaust setup)

Distributor advance on 65 engines re: turbo

If we take a look at the total ignition timing advance (static+centrifugal+vacuum/retard) for all 4 Corvair 1965 engines we can see what a disadvantage the 180 has compared to the other engines.   Let's say we're cruising along at 3000 rpm (around 60 mph) with light throttle (say 10 inches of mercury intake manifold vacuum) trying to get reasonable gas mileage.   Under these conditions the 95 hp engine (manual trans) will have 36 1/2 degrees total advance, the 110 will have 35 degrees, the 140 will have 47 degrees and the poor 180 only 24 degrees!   Since the centrifugal advance for the 180 only starts at 4000 rpm and it has no vacuum advance, it's stuck

with the static 24 degrees at anything below 4000 rpm and non-boost conditions. This helps contribute to it's poor throttle response (aided and abetted by the long distance from carb to intake valves) as well as it's reputation for poor gas mileage. With it's low compression ratio and higher octane gas requirement, the 180 deserves and can handle a significant vacuum advance. In the years that the turbo engine was produced one wonders why the factory didn't devote time to sorting out a mechanism for both vacuum advance and pressure retard on the same distributor.

Turbo exhaust

Big perf. improvement from changing mufflers. Would (for a turbo) especially recommend a supertrapp. That way you can tailor boost curve the way GM did--with backpressure. Cheap (compared to wastegate), simple, and adjustable with one little allen wrench without lifting the bonnet.   The best money you can spend is on a wastegate. I have built many turbo motors and my latest with a low inertia turbo, separate wastegate got full boost @ 2000-2400 rpm. If slipped clutch little, had full boost at bottom of 1st gear. New Deltagate wastegates are only $250 and I just saw 2 used ones for sale in Buick GN email list for $75 ea. You can't spend better money than on a good wastegate.

Wastegate

I see there is a question on the board with regards to roto-master wastegates. Apparently these wastegates and their parts have all been disco'd[not the lousy music--even worse] I could be wrong, but as I subscribe to several turbo specialty publications, I seem to remember being told the sad story. At the same time I would like to put a question to the board. Has anyone ever heard of a "part-throttle-open" wastegaste? This is described in detail in the "HP Books-Turbochargers" by Hugh MacInnes. It is described in detail on page 86.[there is further evidence that by this book's last printing, the rotomaster is defunct--too bad because it was an easy bolt-on.] There are many manufacturers of wastegates, but I have never seen the "part-throttle-open" design advertised. This design is neat because it allows you to use a scroll for real-early spool-up without the back-pressure problems, and boost-while cruising problem. During cruise, it by-passes the turbine thus disallowing any back-pressure and "cruise boost", and then the second you step on the gas the vacuum-operated valve closes and spools-up the turbo. I would guess that it might increase lag marginally, but if you had a crown or modified scroll to bring the boost in earlier, big carb, e-flow impeller, low-restriction muffler, then you would likely have faster spool-up than stock anyway. The advantage would be a great street machine that wouldn't melt it's exhaust valves, with great boost power when demanded. My understanding is that this was used on certain stock O.E applications. Maybe somebody has heard of this type of wastegate,? Dave Binnie

Exhaust gas temp

Are you sure you don't mean 'Turbine INLET temp'? Most gas temperatures are taken in front of the turbo (concern for the gas temperature going into the turbine housing and turbine wheel).

I have not measured the actual CORVAIR temp, but again, most gas engines at WOT, full load, rated speed are somewhere around 2000d F (or slightly more). Temps max out at peak torque point.

That’s way its important to idle for a minute or so before shutting off an engine after a hard run. The soak bake temps are killers for the oil coking problems, as well as the other engine components. Measured temps BEFORE turbo range from 1250 deg F to 1550 deg F. Even cruise will show 1000 to 1200 deg F. Only at idle will you see temps of only 700 deg F. After the turbo, during WOT would see couple 100 deg drop. Need gauge to 1500 deg for all conditions.

Turbo heads

With all the boost your talking about making, I would strongly recommend reducing static compression ratio some. Unshroud the valves, maybe step-mill the pistons for a little. Get your static C.R. around 8.0:1, maybe less. IF you're not going to redo the whole head, you could do well just sticking 140 heads on with combustion chamber work (and valve reseating) when the money thing comes up

Useing 95 heads:

Part of the reason I did not suggest 95 heads is because of no oil drain, the fact of completely rebuilding (you may have wanted to do this anyway but you sounded like $$ were of importance) the 95 heads with guides, valves and a slight problem of what to do with the thermistor for right head. All of these problems can be overcome, like I said I thought $$ were involved here. FWIW the 62-63 heads had a quench area with a very

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similar design to 95 heads. It has been my understanding through reading more than anything else that GM designed the open chamber heads to help with the heating problems and realized how good the open chamber worked and carried it into the smog years of 68-69. To my way of thinking then the open chamber would be a cooler charge. I do realize the facts that the quench heads move the charge closer to the spark plug and have better firing qualities too. I don't know what year of engine you have, 62-3 or 64. There are 95 style heads for 64 too, wouldn't need spacers just the proper heads. If you pin me down, I guess that I couldn't really say which set of heads would work best, to me the turbo heads MIGHT require the least amount of work. I have used both the 62 style and 64 style as well as 140 heads on turbos through the years and since every engine is a little bit different with cam and cam timing and other little things, I really couldn't say that if one set of heads were exchanged for another that it would make a difference. I do remember one time that a car came in with 140 heads and had a seat ring out of each head, the customer brought a set of 180 heads along and I rebuild those and installed them in place of the 140sHe claimed the engine ran better BUT it could be that the 140 heads
needed looking into before the seat rings came out.

Why not 95hp heads (Ray Sedman)

The early Turbos 62, 63, had a 'squish' type head. 64-66 had a head w/o any squish as to keep the compression ratio at the (stated) design limit. The stated C/R is 8.0:1. On heads that I measured, the C/R is almost a full point lower that stated.

As a general rule, squish type heads will exhibit more resistance to pre ignition (ping) than non-squish type heads. Given the same C/R, a Turbo will not show an increase in H.P. with a squish type head as compared to a non-squish head. You may gain a small increase in fuel economy and lower emissions (if that REALLY matters <g>) by using a squish head.

I have built Turbo engines w/mostly squish type heads. I have not built any 'stock' engines, so the following comments may not be relevant in your case.

The 'pros:' The engines run just fine with squish heads. More 'snap' on the bottom end, a bit better low speed response. I recommend keeping the static C/R at, no more than, 7.6:1, if you are running (92 octane) fuel. Keep the total deck height at 0.040 - 0.050".

The 'cons': Not stock, goes w/o saying . The turbo oil drain line. To do a 'clean' work around, this requires some careful planing. If you deiced to dump this back into the head, make sure it does not dump on top (into) a valve spring pocket area. Thermistor: If you are not using 140 heads, you will have a 'fun' time welding/machining the necessary boss to mount the thermistor.

Parting shots: Is it worth it? If you are running a 'stock' Turbo in a street car, I do not know if it would be worth the work. If I had to keep it 'stock' looking, I would have a custom set of pistons made with a 'pop-up' top to match the configuration of the chamber. I would keep the C/R as recommended above. You would have the advantages of a squish head w/o the disadvantages. Assuming you are rebuilding the engine, and require new, forged pistons, there is not that much cost difference for custom pistons over the current TRW prices. I would recommend a Dale Manufacturing vacuum advance/pressure retard unit. This is an excellent improvement to a Vair Turbo.

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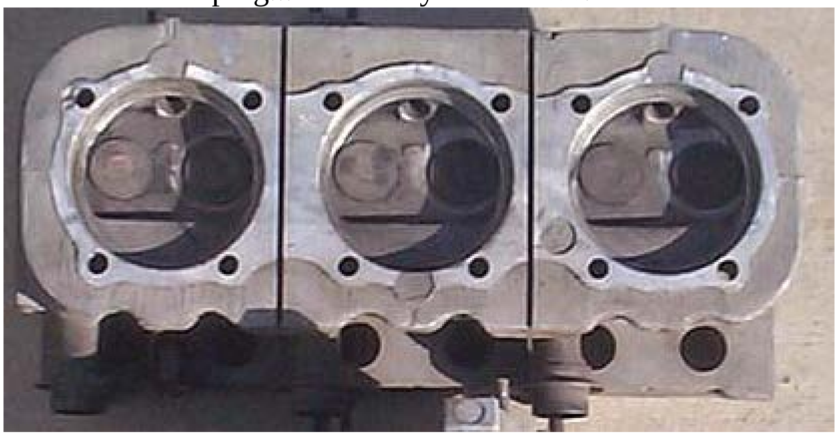
Keep an ear out for ping. Even with a C/R or 7.5:1, you may still exhibit ping; especially under boost conditions. Water injection or knock retard is very prudent. A normally aspirated engine (with forged pistons) will tolerate some ping, a Turbo engine under boost and ping...that is very destructive.



(Late model 95hp heads)

More on 95 heads:

I've told this story before... the strongest turbo engine I ever had was one that I built following some tips in a magazine article I read many years ago, which demonstrated how to get over 230 hp from a late turbo engine with nothing but bolt-ons. It involved swapping the heads out (late turbo heads are a *Terrible* design, dump the damned things and run 95 hp heads with bronze guides installed etc) and changing the distributor around, as well as running a different exhaust. The article described how they went with an aftermarket camshaft in their test engine but did mention that the factory turbo cam is fine for street applications. My engine used the smaller early turbo and carb both, bolted up to the late engine. It was capable of making boost earlier than the larger carb/turbo combo and in fact would start showing positive indications on the gauge in 1st gear, and respectable boost in 2nd, and a LOT in 3rd. I surprised a lot of people with the car and had a lot of fun with it. It was also very driveable and idled as smooth as any 'Vair engine. The distributor was a modified 110 hp type, refitted with a pressure retard and whittled weights/springs. This engine needed much less initial advance what with the better chamber design in the 95 heads, which had a squish area and better flame travel etc, meaning that you didn't need to crank in so much ignition advance to get the engine to make power. I recall running somewhere around 15 degrees advance instead of 24, trial and error eventually got me there. I found that timing this engine combination was much easier to deal with than the timing adjustments necessary with those sorry-assed open-chamber factory turbo heads, which to this day puzzles me as to why GM offered up late turbo engines with these heads in the first place when the already pre-existing 95 hp heads work so much better. Go figure... Maybe somebody somewhere wanted to keep things simple and limit the horsepower a bit, keep the engines together long enough to meet the warranty. In any event, the engine configured in the manner I described ran stronger than any turbo engine I ever owned or drove (that was built with factory hardware, not counting the exhaust) and it was definitely fun to drive

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Ray says:

May I add that 65-6 turbo heads with the stock flat top pistons are the most prone heads to spark knock of any Corvair head. The lack of any squish area in the chamber and a poor chamber design makes these 8:1 heads prone to spark knock even with 92 octane fuel while the engine is normally aspirated. The 62-3 turbo heads have a chamber design like a low HP Corvair head (with squish) and will tolerate low octane fuel when run normally aspirated. If you have a choice of heads to run on a modified Corvair turbo, the factory 65-6 turbo heads would be my [personal] last choice.

95hp heads:

Everything I've heard (bear in mind I've never owned a turbo) is that 95 heads ***milled .050" to eliminate the step is the way to go***. I'm a strong advocate of pocket porting the heads too (the stock ports are frightfully rough). Suggest at minimum staking the seats, better yet put in bigger ones or set screws to hold them in, as you will be running more head temp and the heads are 30+ years old. Late heads can be milled about .060 or less and ***the squish chamber*** helps reduce detonation. They would need bronze guides also. If fuel is a problem in your area you may want to mill a step in the pistons under the valve pocket area to reduce compression and retain the quench chamber. I use milled 140 heads on my racer with milled piston steps and about 9.5 comp ratio and 15 psi. You must have new hi-press valve seats if you use the 140s . The 95s do so well that 140s are only for the lunatic fringe like me

Rays idea on turbo heads

What is better for a performance street turbo? A nice, ported set of small valve heads or a 140 head? This question I get asked more than a few times a year. :-) The answer really depends on what the rest of your engine is going to be, how much you budgeted for head work, what types of heads you have sitting around, etc. I'll try to sum it up with the following: My preference of small valve heads, in order:

62-3 turbo heads. No modification to chamber needed. Head gasket registers need to be enlarged to late O.D..

95 hp heads and 80 hp heads. Need to add oil drain and thermistor hole if using thermistor. Head gasket registers need to be enlarged to late O.D. on 80 hp heads. Very early heads will require spring pocket changes, so these are not so desirable.

110 heads. Need to add oil drain and thermistor hole if using thermistor. May need to remove part of wedge in chamber to lower C/R.

180 heads. No modifications to chamber needed. They can be modified to work properly, but for the cost, you could do a complete set of early turbo heads.

Smog heads. Similar chamber as 180 heads. Will need to add oil drain and thermistor hole if using thermistor.

RE: 140 hp heads vs. Small valve (SV) heads. Given you have a set of 140 heads, I would use them. Right off the bat, this saves in the cost to install 140 exhaust tubes in SV heads. The cost of larger exhaust valves in SV hp heads to match the 140 exhaust tubes is not an issue since the exhaust valves need to be replaced anyway for turbo use. A larger valve is basically the same price of a smaller valve. Again, this only holds true when the valve seats are being replaced; we just machine for a larger seat. You will also need to do quite a bit of port work to make these heads flow as well as 140 heads.

We can do a proprietary chamber modification to 140 heads which will allow a low C/R and a good squish. Because of the extensive welding to the chamber, we can

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only do this when new seats are installed. We can also remove the second carb pad on each head, so when they are installed they would look similar to a SV head. The 140 heads also give you the benefit of the stock thermistor location which is deep into the chamber. This is the ideal location to install the thermocouple or thermistor. Non-Turbo, SV heads do not have the deep bore for the head temp snap switch. Small valve heads will cool better than 140 heads because of the larger fin area. An oil drain from the turbo will need to be plumbed, but that is the same given any non-turbo head. Typically, this would be run into the valve cover, or to a welded boss on the bottom, forward side of the head. In my humble opinion, the use of a 65-66 turbo head is the last head I would use for a performance street turbo engine. There is no squish in the chamber. I would rather use a 62-63 turbo head or any other SV head. As for the difference that the 140 head will make, I basically feel it is in the larger exhaust tubes and better exhaust breathing. The intake side is larger also, but I feel this is less of an issue with turbo engines since the intake charge is already compressed as it is stuffed down the ports.

Steve Goodman's take on 95hp heads:

RE: carb choices, my choice is the 2 bbl downdraft STROMBERG WW. It is much easier to work with than the DCOE and cheaper too. Also the HOLLEY 500cfm 2bbl is good. Of course if the engine is big enough, a 4bbl is needed, the WCFB or a quadrajet works best. Use **95hp heads** with the step removed and an F/B turbo with a good muffler like a FLOWMASTER and 3.27 or 3.08 gears if the engine is big enough and it is a moving car. Or a tight exhaust scroll will help and naturally the E flow is better yet. Trouble is too much boost will get you in trouble and a waste gate is needed and water injection, pretty soon the engine bay is filled with accessories. Try to keep the car lightweight BUT THE BOOST IS FUN!!!!!!!

A vote for stock Turbo heads: posted by J.O.

As for turbo heads, I am of the belief the GM engineers knew what they were doing, for a lot of sound reasons. They early turbos used the quench heads but they choose to elimiate the step on the 180. Some people think they just cheaped out. Anyone of us could easily retired in comfort if we had the R&D money GM spent on te turbo cam alone. Unfortuatly the heads are not well documented. The open heads will dump more than any other design (also why they used them with smog). There is so much turbulance under boost that squish is not an issue. They will breath better because there is a slight shrouding effect from the step. They have the least amount of internal surface area. You can cram a little more fuel/air into the space taken up by the step.

More turbo tips:

Has anyone had experience with alternate timing curves - modified Yes. The Turbo engines are very responsive to careful timing (curves) adjustments. Or you may say that Turbos are very picky to timing curves! Again this really depends on the complete 'engine' package. The complete ignition system of a Turbo MUST be in top shape, especially with today's fuels.

>pressure retard, vacuum advance or centrifugal advance? Pretty much the same answer as above. You MUST use some type of boost retard. It can be the stock pressure retard system or some elaborate electronic retard. I have run all different combinations of the above. The results can be summed up as such. The more you modify the stock system (engine, ignition, exhaust, carb.) the more you have to play with the timing, advance curves, retard, water injection and carb. jetting to get the engine to run correctly

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and not incinerate spontaneously. Also, is it important for you to be able to DRIVE the car everyday?

>How about carburetor modifications or alternate carburetors?
SU, Webers and Q-Jets are popular alternate carbs. Stock carbs. Are designed to limit boost and H.P. Quite surprising H.P. increases can be had with alternate carb. systems. The caveat here is, your engine may not like the increased H.P. Stock carbs. can be made to operate quite nicely. Once setup properly, they are smooth, responsive and will generate fair fuel economy. They will also keep you, and your engine out of trouble, read: you will not grenade you 'old tired' stock engine.

>Has anyone tried an electronic ignition with knock sensor - can the
one from Buick V6 be modified for Corvair use? I would think that any O.E.M knock sensor can be modified for Corvair use. It is really much easier to purchase an aftermarket system off the shelf. Any positive experiences with antidetonant systems? Knock sensors, water injection, etc. They all work - depending on the engine combination and other 'parts'. Most of them do required some sort of 'dialing in' or tuning to extract the proper performance. Turbos require time, effort, patience, more patience and a very good sense of humor. Once running correctly, they are a real joy.

Cockpit boost controller:

I wish you all the luck in the world getting into the 12's, but keep in mind that I do NOT recommend that you go above 15lbs of boost with the stock fuel pump/fuel computer. By going higher than 15, you run the VERY real risk of blowing up a very expensive engine. Take it from me...I already blew one up and it's not much fun. If you are unsure about ANYTHING contained within this FAQ, PLEASE e-mail me at jfm127@psu.edu This will save yourself from a lot of frustration and possible injury if you screw up. ALSO, you MUST have an aftermarket boost gauge! The factory boost gauge is WORTHLESS as it does not measure actual pressure, but instead samples the speed and density of the incoming air and guesses what the boost should be. That's NOT good enough! The boost gauge should also measure vacuum, but it's not as vitally important. COCKPIT VARIABLE BOOST CONTROL FAQ here's what you have to do: Go to Grangers (an industrial supply store) and purchase part # 6ZF65 for the bracket and #2Z767 for the air pressure regulator (it should have a yellow knob with a locking ring) and (2) 1/4 90 degree barbed hose fittings Go to any pet supply store and buy a simple in-line bleeder valve (Hartz makes a nice brass one). Buy about 20 feet of 4 or 6 mm generic vacuum tube (available at any auto parts store). You can also choose to purchase some silicone vacuum hoses. Alamo AutoSports sells some nice blue HKS hose. The next thing you do is decide where to mount the regulator. My favorite spot is right where the mini coin holder is (above and to the left of the shifter). Take the panel off, and just snap out the coin holder. Now, push the knob of the regulator through the rectangular hole, and using the black plastic nut that came with the mounting bracket, screw the nut on top of it until it's in there tight. Another really nice location for this is where the cigarette lighter is. I don't smoke so it's not a problem for me. The hole there is the PERFECT size for the regulator, and it looks surprisingly stock. I'm moving it there as soon as I'm done with my other projects... Now attach the vacuum lines to the regulator (one side will have an
IN arrow, and the other will have an OUT arrow), and run them beneath the radio and around to the steering column or speedometer cable grommet in the firewall.

REMEMBER which line is IN and which is OUT You can now replace the panel that was removed in #3. Now, cut a hole in the steering column boot, and run both vacuum lines through into the engine bay. Route the lines behind the intake manifold, then around the engine on the passenger side. Run the IN line directly to the wastegate actuator, and run the OUT directly to the connection on the output pipe from the turbo to the lower intercooler hose. It really doesn't matter which line goes where, but keep in mind that if you reverse these instructions, the direction in which you turn the regulator will have the EXACT OPPOSITE effect as I describe later. Now, get rid of the wastegate solenoid and all of the old vacuum hoses associated with it and replace it with that nice shiny new bleeder valve. The bleeder valve is to be placed in-line from the regulator to the wastegate, and bled off back to the connection on the air canister The purpose of the secondary bleeder is to MAINTAIN the boost levels dialed in by the regulator. Check all connections, and start the car up. Check your vacuum gauge to determine if you have any leaks. A healthy engine should read
18-20in Hg at idle, and around 22-23in Hg @ 1800 RPM in neutral. Adjust the bleeder valve so it bleeds off only a little bit of air (it's very sensitive so you may want to adjust it before installation by blowing through it). INCREASE (screw in) the knob of the regulator ALL the way. This will give you approximately stock boost since the wastegate will “see” all of the air the turbo is making. Now, to increase the boost, UNSCREW the regulator. This will close the valve, making the wastegate see less of the air the turbo is making. The only fun way I know how to adjust this, is to find a nice long stretch of road, and just keep unscrewing the regulator SLOWLY (once you hit a certain point, it becomes EXTREMELY sensitive) while you have your foot DOWN at WOT. This may take awhile, but I don't think you'll mind too much... Using your boost gauge, determine where you want the boost to be, then lock the yellow adjusting ring by snapping it down.

Take a few more passes, to determine if the boost is steady, or if it creeps or falls. If it creeps up, close the bleeder slightly. If it spikes, then falls off, open the bleeder slightly. I find that this setup is very consistent during temperature and weather changes, but you have the boost control knob right at your fingertips, so it should never be a problem anyway. WARNING!!!!!! Once you get to a certain point with the regulator, it becomes VERY sensitive. You MUST adjust it slowly to avoid an overboost condition which could destroy your engine. Also, to take full advantage of the consistency of this method, you should have a free-flowing aftermarket exhaust, intake system, and an upgraded fuel pump at least.

Exhaust jet hot coating :

There are better solutions for preventing exhaust rust, look into some modern coatings. Jet-Hot coatings and similar operations coat the metal inside and out and it will last almost forever. The best part is that it will always look as nice as the day it was applied. I'll second the Jet-Hot coatings for exhaust systems. I've had my complete turbo exhaust system done and think it is great. (Not stock Concours though.) The coating is rock hard and chip/scratch resistant. You can get a variety of finishes, ranging from near chrome to black. Prices are about $10 per foot of pipe. They will take old, rusty system, weld minor holes, and coat them if you want. (I assume they sand blast them clean first.) Of course a pitted surface will still show the pits, but it may be a way of salvaging hard to find parts.

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