SPYDER ENGINE TEARDOWN MANUAL

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SPYDER CORVAIR CONVERSION ENGINES

Introduction

By Bill Clapp

Welcome to the world of auto engine conversions. This is the first of many steps into a new adventure of learning. It is an adventure that I began many years ago when I rebuilt a VW turbo engine for the KR2 my father gave me. At that time in 1992 it was not a scary or unknown process to me, having rebuilt many VW engines while a teenager and working on my 73 VW Sunbug and Bradley GTII. I grew up around airplanes and engines as my father was a MAF mission pilot plus I had a fresh A&P license, so taking that VW turbo apart and rebuilding it was not a unknown experience to me. I have found, however, that this might not be your story.

Dad's KR2

Most people that are looking at auto engine conversions are very fresh to the experience and find it intimidating. Many have zero engine building experience and are diving into the deep end without many swimming lessons.

Learning to build a successful auto engine conversion is a bit like eating an elephant….take one bite at a time ….start at the top! There are hundreds of success stories through which you can gain confidence that you can do this also….as well as failures to remind you of the seriousness of the tasks involved. Be diligent and do your homework.

My Personal Corvairs – 66 Monza Convertible and 66 Monza Coupe

The Corvair auto engine was designed by GM for the Corvair series of automobiles from 1960-1969. It was a very successful program and ended in 1969 due to costs. However, with over two million engines produced, there are still plenty of cores around for us to use in our experimental aircraft. When I first heard about the corvair conversions on-line, I went down to the local junkyard a bought my first core for $100.00. After power washing an inch of grime off it I tore it down. My first impression….I was impressed!

I was operating an automotive restoration shop in the 1990s and worked on VWs, Austin Healy's, Triumphs, MGAs, MGBs, Sprites, and such. Many engines had been apart on our benches and rebuilt. This engine by GM was very well built. It was very stout and rugged in design with plenty of cooling capability. The simplicity of the design was very attractive to me. At that time I was building my KR2S and the corvair was going to work well with it. Decision Made!

Homework time….I started learning more online about other people doing corvair conversions. I visited and spoke with corvair pilots and looked over many projects. My shop was well stocked with tooling capabilities so I was able to start designing and building my first engine. N41768 first flew in August of 2004…only eleven months after starting my build. The engine was very simple in design but very functional for the flying I was doing. It was such a joy to fly that plane. I flew to Sun n Fun and Oshkosh many times over the years with that KR2S. It became the learning table and backbone to my future design work.

Was it all perfect? No. ***First rule of experimental aircraft aviation: An aircraft built by human hands is prone to failure and wear***.

My first engine ran great for 140 hours … multiple trips to Wisconsin, North Dakota, Denver, Florida, Missouri….many states and awesome times. Flying home from Florida one day I noticed a slight vibration that was not normal. I chose to land cautiously at a nearby airport where I determined the vibration to be caused by a broken crankshaft….I mean in two pieces! WOW! And it still ran. Made me grateful I had chosen the corvair to give me that safety margin.
Ok…first repairs. I replaced the crankshaft with a "Nitrided" (a process that hardens the very outer surface of the crankshaft to prevent the introduction of cracks while the inside material stays pliable) crankshaft. All the other components were not damaged…so after reassembly, back in the air we went. Because of standard maintenance practices and replacement of wear items the airplane performed very well for the next 500 hours. I was averaging about 300 hours a year on this bird.

Although the engine was performing well I saw the need for a propeller hub support bearing for the crankshaft. The long moment arm of the propeller to the first support bearing was of concern and the fact that a couple other crankshafts had cracked made the need more apparent. I began designing what is now called our IFB…or Integrated Front Bearing. The redesign had to incorporate my goals in aircraft design….simplicity and fewer parts count. In addition to the IFB, I designed the RASK…Rear Alternator and Starter Kit. It also simplified the charging system while increasing its capability from 15 to 32 amps (and higher). It also removed any brackets and belts.

<u>Second Rule of Experimental Aviation: If you don't have it, it won't break!</u>

Simplicity…no belts, alternator brackets, safety shaft, prop hub studs, complex bearing or seals…. less to go wrong. We use off-the-shelf parts for any high wear components as much as possible. This makes repairs less costly and we have inventory all over the country! Not a perfect solution but it certainly helps.

2009 was the first year I began to fly the IFB engine on my KR2S. I removed the original engine (it was later installed onto a Zenith 701 and flew for several years) and installed our new IFB conversion. It is now 2018 and that engine is still on the KR2S and flying. Last time I looked it had about 750 hours on it. The airframe was at about 1300 hours. There were very few changes to our current conversion design of any consequence. We did improve the simplicity of the RASK and allow for even simpler maintenance. We have improved our distributor design as well with longer maintenance intervals in mind.

As of 2019 we have continued with our stock 100 HP engine design in a very stable production mode. In 2016 we began flying our 120HP version of the SPYDER IFB (stroked new crankshaft, new rod and piston design) with a turbocharged version being introduced in 2017. As we continue with our testing and design work we will publish the information on our website. Our production goals for the 120 HP Spyder Engine is to improve our inventory and supply chain in order to have parts on the shelf at all times. This is important as our numbers increase and replacement parts and service become more necessary.

Where are we going…? My goals for SPYDER engine development right now are to have a turbocharged 130HP Spyder engine for both rotation directions for a twin engine aircraft I am designing. Part of that success is a feathering propeller for these engines as well. We are nearing those goals at this time.

Currently our fleet of Corvair aircraft consist of a KR2S, the Saberwing Prototype, the first Saberwing LSA tri-gear, a Zenith 750 STOL, and soon a Pietenpol. As our company grows we will be adding more Corvair powered aircraft in order to demonstrate the versatility of this incredible engine.

Spyder 120HP Installation in my Saberwing Prototype – pre-turbo

THIS MANUAL:

As you read through and study this manual keep in mind that the focus of the teardowns and builds are focused on our design principles for the SPYDER conversion engine. We aren't discounting or implying any fault in other Corvair conversion that have been on the market or will be. This manual is about our methods and procedures and how to help you build one of our conversions. If you have any questions or ways our manual may be improved to help you during the teardown please let us know so we can implement necessary changes.

So, as you read this take courage that you too can accomplish your goals if you can define them and then create a step by step process to achieve

them….back to eating elephants. Take your time, learn, be patient, ask questions, take precautions where necessary, grow friendships, be forgiving, love your family and friends, remember what is important in life.

And so the journey begins……

KR2S N41768

Cover of Sport Aviation Dec 2009

CHAPTER 1

Where to Start.

So you are looking for a Corvair core. What, where, how much, and what's next…?

The What:

You are looking for a late model 164 cu.in. Chevrolet Corvair Engine. These engines were produced in large numbers from 1964-1969. The early 145 cu.in. engines had non-stroked crankshaft and cases that did not have the room for the stroked crankshafts. You are also looking for an engine that would have the correct combustion head design for aircraft use. The basic rule of thumb is that any late model 95 HP or 110 HP Corvair engine will work. On the top of the crankcase near the oil filler spout you can find the serial number for the case. If you are in a junkyard, use a screwdriver or the oil dipstick to clean off the grease that is likely to be covering the number. Here is what you are looking for:

Engine in car…notice the oil filler cap. The case number is just below and in front…must clean to see number properly.

You are looking for a number such as T0129RA…the important thing to look at are the last two letters. Here is what you want:

110 HP: RD, RF, RH, RK, RX,

95 HP: RA, RE, RG, RJ, RS, RV, RW, AC, AD

(note: not all the heads on these are good for flight engines – we can mill or exchange heads if they are available) The majority of these engine numbers are really good for the Spyder Conversion.

The other models that are usable but may require more research are 1964 models with these engine codes:

110 HP: YN, YM, ZF, ZG 95 HP: YC, YL, Z, ZH, ZD

The top cover of the case of these may need to be opened to determine if the case/crank are appropriate.

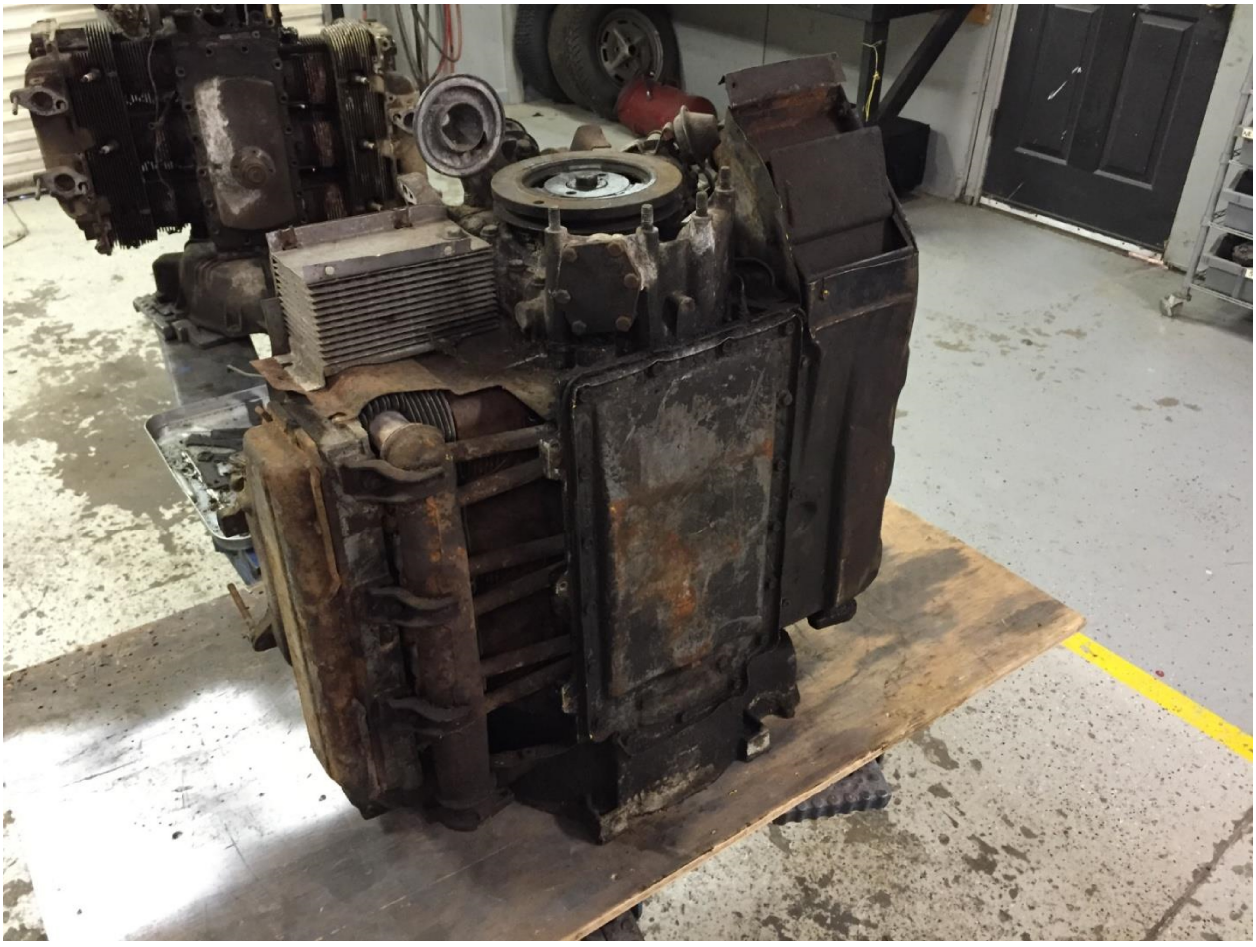
The heads may be usable but have a unique cylinder for 1964. The cylinders for the 1964 are the same dimension on the bottom where they fit into the case but are slightly smaller diameter at the top. The heads can usually be fly-cut to use 1965 and later cylinders.

Once you have determined that the number is suited for your build, the next thing to check is its condition. Take along a ¾" wrench or socket/ratchet to turn the crankshaft at the main pulley. If the engine turns over freely you will have a much easier time in disassembly.

THE WHERE:

A local junk yard can always be a good place to try to locate your first core. If they don't have a Corvair car or engine there they know a lot of people and other yards that may have what you need. I got my first core from a local junk yard for 100.00. Later I bought five core engines from another yard about 20 miles away for 500.00 (for all five). I cleaned one up and installed into my 1966 Monza that I still drive today. You can also contact the local car club such as the CORSA CLUB where you may find car enthusiasts that may also be able to point

you in a direction. Try online through Ebay, Craigslist, or one of the corvair aircraft sites such as Corvairpilot.com to ask other corvair pilots about cores. As a last resort you can contact us to see if we have cores available for you to purchase. We normally keep several on hand for customers.



Picture of 110 HP Engine (looking at the bottom) ready for teardown. It is missing the left side air ducting (somebody wanted the thermostat I guess) 140HP engine core in the background – notice the two carb flanges on one head.

THE HOW MUCH*:*

A good core, right numbers, and turning over, should cost somewhere around $500. Many people may want to sell you an entire car…if it is a good deal then be sure to find some car guys to share your spoils with. I have paid more for

really good cores that have parts I can use or sell to the car guys. If you are willing to be patient and do a little wheeling and dealing you can come up with all the parts you need at a fair price. A few simple questions can often lead you to finding the right core for a great price.

110 HP Corvair engine sitting on bellhousing in the shop – ready for teardown. Notice that the carburetors and alternator have been removed. Car guys want those.

THE WHATS NEXT?:

Pick a day where you won't be wearing your phone on you, wear a dirty shirt (and pants…), and be ready to get dirty. I recommend that you take the

engine apart using either our **Teardown Manual** or the **Corvair Green Book** as it is called. Step one…Drain any oil out of the engine. Two…Basically, you will start at the top and work your way down, taking the engine apart. As you do, spend time to become familiar with the names of all the parts and pieces and how they came apart. You may want to lay all the parts out on a large piece of cardboard like a puzzle. Our **Teardown** chapter will show you the parts to keep, trade or throw out.

I have a pile on the floor now…

Work your way through your piles, separating the good parts from the bad as far as use. Later you will separate according to condition. We throw away most of the hardware into a mixed bin for shop use since it will all be replaced with new. Now that you are at this stage you will have a better sense about what percentage of the engine you want to build yourself and what you want to send out for conversion. We are glad to help you with any of these parts and procedures during your build. Many people have built their own engines using our short blocks and traded in just a case, crank, cam, and rear housing cores and done the rest themselves.

What if I just want to buy a kit or engine outright?

We do sell the complete engines or kits outright however we do charge for a core if you don't provide one. We keep a limited number of cores on hand. If you have extra cores we will always consider the option to purchase more than just one against your purchase. The value of the cores is contingent on the condition.

I bought an airplane or engine with a Corvair Conversion…what can I learn?

One of our concerns as a company is the growing number of people that have purchased aircraft or engines with Corvair Conversion engines with little knowledge of how the engine operates or is installed. Aircraft that are sold in this manner have to have their yearly Condition Inspection performed by an A&P or the original builder to conformity. Many A&P's may be a little leery of working on an unfamiliar engine. We hope the information we provide you will help you become more familiar with the engine you fly behind, as well as learn how diagnose troubleshoot any issues you may encounter. This information will also help you in determining upgrades and improvements you may want to consider in the future.

Picture of some of our extra cores…..

CHAPTER 2

THE TEARDOWN

As stated in the previous chapter you may want to purchase a Corvair Green Book to aid in you the teardown and buildup of your Corvair engine. However, the information here should be adequate for a successful build. Let's get started.

If you have not done it by now…drain the oil. Set the engine up on blocks or on a table (strong) with the drain plug (Bottom of engine on oil pan) in an accessible position. Tilt the engine so the oil can drain well. Place a large container under the engine and remove the drain plug….usually a 7/8" wrench or socket will fit these plugs. The oil may be very thick so it will require a bit of time for the oil to all drain out. While you wait lets go ahead and begin removing the engine cooling tins.

Before removing the fan housing… (Commonly called a turkey roaster) If the spark plug wires are in the way, remove them (and discard them) by pulling them loose of the plugs and off the distributor cap. Remove and throw away the distributor to coil wire as well. If the fan belt is still on the engine, loosen the pulley on the right side across from the alternator (two nuts with 9/16" wrench or socket). Throw away the belt. Remove the two bolts (9/16 socket with extension)

underneath the alternator. Lay the alternator aside to sell or donate to Corvair car guys…unless you plan for your own car. Around the engine you will notice several steel cooling tins that are held on by an assortment of small bolts. Usually a 5/16”, 3/8”, 7/16”, and 9/16” sockets will remove the majority of the bolts. Start by removing all of them around the perimeter of the fan housing. If the carburetors are still on the engine, first use a 7/16 and ½” wrenches to remove the fuel lines. Sometimes the line fittings are tight and don’t come loose easily. Use a vice grip to take them loose if necessary. Use a ½” socket to remove the two hold down nuts on each carburetor. Disconnect the choke wire clips. Lift the carbs off the heads and put aside for the car guys. The turkey roaster should be accessible now.

Around the engine you will notice several steel cooling tins that are held on by an assortment of small bolts. Usually a 5/16”, 3/8”, 7/16”, and 9/16” sockets will remove the majority of the bolts. Start by removing all of them around the perimeter of the fan housing. Sometimes grease and grime can hide the little bolts near the oil cooler or at the back near the bellhousing. There are three small bolts (1/4” socket) to remove the cooling air outlet at the back right side.

Remove the turkey roaster!


Notice small nest…….

Work your way around the engine removing the other tins. It will be apparent which bolts or screws are holding them down if you work on them one at a time.

Once all the tin is removed place aside for car guys. There are only two small tins you will keep. These are the ones on either side of the crankshaft pulley.

Reinstall the oil drain plug. Use a 9/16 socket to remove the six exhaust manifold nuts. There is a little safety clip you will have to bend out of the way with a screwdriver to be able to put the socket onto the nuts. Once the clamps are removed, tap the exhaust manifold with a small hammer to knock it off the head exhaust stacks. (give to car guys)

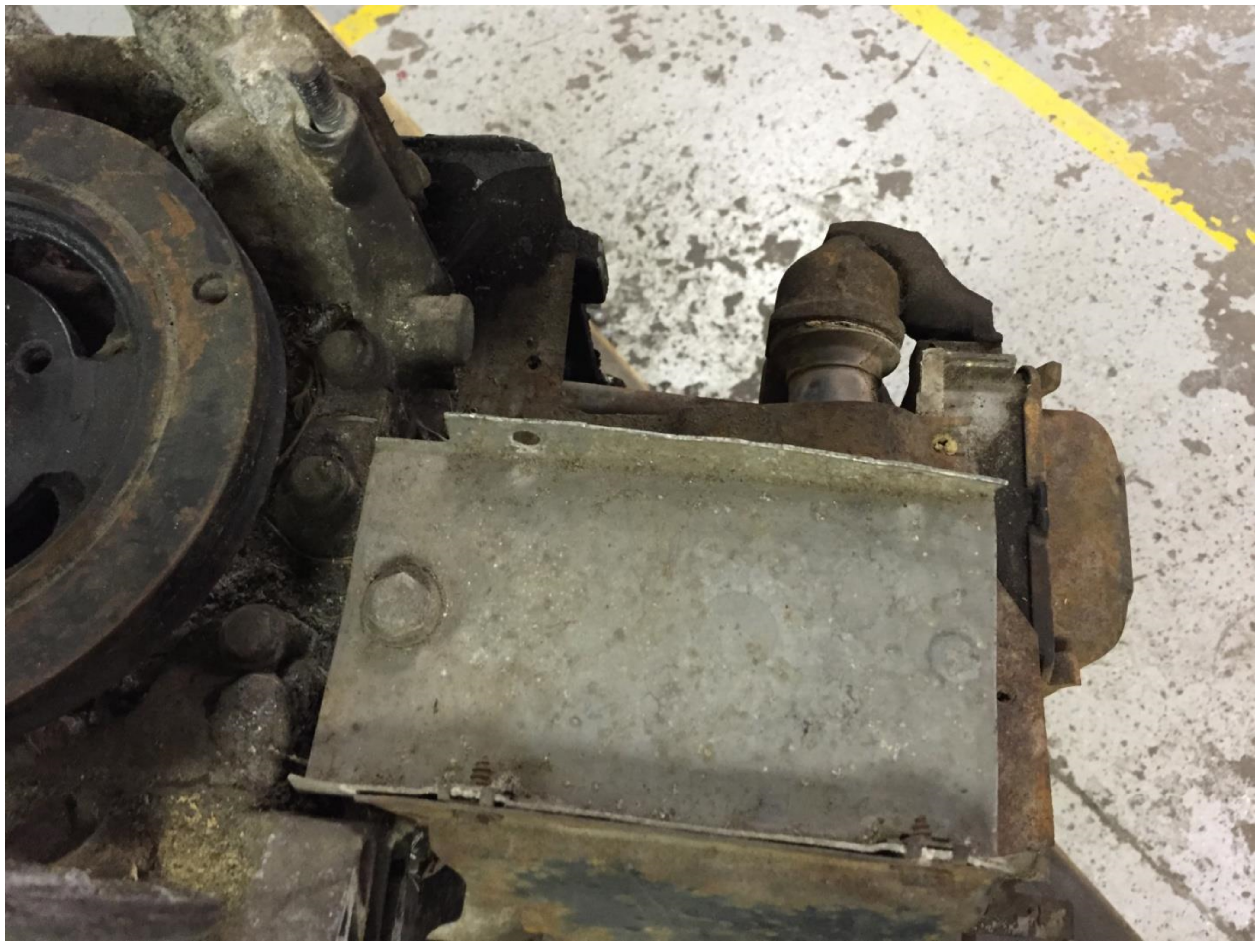
Remove the four small (5/16 socket) bolts that hold the fan onto the fan bearing. You may need to wiggle the fan back and forth to get it to slip off the bearing. (give to car guys)

Roll the engine outside and pressure wash it if you desire…now is the best time.

Remove the nut to the right of the ignition coil to remove it from the engine. (give to car guys)

Use a ½" wrench to remove the fuel pump hold down bolt. Lift the pump out of the accessory housing. Remove the fuel pump plunger and spring from the housing. (give to car guys)

Remove the oil cooler by removing single long bolt (9/16 socket) and short bolt from head. (for car guys)



Remove the 9/16” nut below the distributor. Remove the distributor clamp and lightly tap up on the distributor to remove it from the accessory housing. (keep the distributor and clamps for core)

Remove the five hold down bolts (1/2” socket) for the oil filter attachment (Deltron housing). Use a small hammer to tap it loose if necessary.

Remove the harmonic balancer or pulley using a gear puller (can rent from auto part stores). There are two holes on either side of the main pulley bolt that are 3/8”-16 thread to use for the puller. Use a ¾” socket to remove the center bolt. Keep the thick washer for core. Install the puller and remove the pulley. Sometimes harmonic balancers have a core value for the car guys.

Remove the four 9/16” nuts and single bolt that hold the bottom skid plate under the pulley.

Remove the seven bolts (1/2” socket) that hold the rear accessory housing in place. Tap the housing gently to remove it from the case. (keep for core)

Remove the 16 bolts (9/16” socket) that circle the blower bearing housing. Tap the housing to remove it and the breather plate from the case. (car guys)

Remove the Flexplate or clutch plate from the crankshaft – big end – by removing the six (9/16”socket) bolts.

Remove the 9 bolts (9/16” socket) that attach the bellhousing to the case. Remove the three small bolts that attach to the bellhousing through the oil pan (3/8 or 7/16). Tap the bellhousing off the case. (car guys)

Place the engine upside down on piece of plywood or table. It will get very greasy and oily. Remove the oil pan perimeter bolts and tap loose. Remove the single bolt holding the oil pickup in place. This (1/2 socket) bolt hold both case halves together and needs to be removed prior to case disassembly. Use an appropriately sized socket that will fit (not tightly) in the hole that the oil pickup fits into – from the accessory housing side. Tap on the socket to drive the oil pickup out of the case. (keep for core)

Flip the engine back over. Notice that the camshaft gear sits below the case…so place on the plywood with cam gear over the edge so as not to damage the gear.

LONGBLOCK Tear down:

You are now done to the basic long block of the engine. Time to remove the heads. Before you get started understand that using screwdrivers and hammers incorrectly may do damage to the parts you want to remove, so use caution.

Remove the valve covers using a 3/8" or 7/16" socket on the eight bolts holding the valve cover clips in place. Throw the bolts out but keep the hold down clips and covers.

NOTE: For the next step you may need to spray WD40, Penetrol, or a penetrant oil onto the twelve upper heads studs and nuts as they tend to corrode and get generally dirty. Lubricating may make them easier to take off.

Use a 5/8" socket and remove the twelve nuts that hold the rockers down. Pull the rockers, rocker balls, and pushrods off the engine. Keep the rockers and pushrods.

Use a 9/16" socket to remove the twelve nuts holding the heads down. These are the six nuts above the valve cover area on each side. Sometimes the head stud may come out with the nut. Don't be too worried about it yet – just pull it out. We can install it again later. Use a 13/16" deep well socket (Spark plug socket) to remove the twelve (six each side) rocker studs. When you remove the rocker you will be removing the six plates underneath them. Throw out the twelve upper nuts but keep the rest.

John is tearing down his engine – Now flying in his Zenith 750 STOL

Pushrod tube Removal:

We built a small tool to help in removing the pushrod tubes. It is a 2" piece of pipe, cut lengthwise in half and welded to a longer tube that slides up under the pushrod tubes and is tapped with a hammer to pop the pushrod tubes out of the head. You may be able to remove the tubes this way or try to remove them with the head. Sometimes you can grab the head and wiggle it a little bit and pull it off the engine. The tubes may come with it this way and can be gently removed by hand afterwards.

You may need to lightly tap the head to remove it from the engine. Use a rubber mallet to do so and don't hit against the fins. Work it a little side to side. It the head gets cocked sideways it won't come off.

Remove the baffles attached underneath the cylinders. They just unclip.

Pistons and Cylinders:

If you haven't been naughty, your engine probably turns over (with a ¾ wrench and large harmonic bolt in place). Look into the case through the top and you will see the two nuts that hold each connecting rod in place. Using a 7/16" or ½" socket remove the two nuts. You may need to rotate the crankshaft to gain access to the lower nut. Once the nuts are removed, "walk" or lightly tap the rod cap of the rod studs. Once off, rotate the crankshaft until the rod is horizontal to the piston and pull the piston, rod and cylinder off.

One by one, remove the piston and cylinder assemblies. If the cylinders seem stuck you can lightly tap on them with the rubber mallet. Take care not to damage any fins. Damaged cylinders cannot be used for core value.

Case disassembly:

Now you should just have a case. There are eight bolts that hold the case halves together. The socket on side is a 5/8" and the other is a ¾". Use a ratchet to hold down the 5/8" side of the bolt and another to remove the ¾" nut. Remove the bolts but leave one loose to keep the case together for next step.

Either get help or be sure the engine is on something soft to not cause damage…like cardboard or rags. Remove the last bolt and lightly tap the case halves apart. Use caution to not let the crankshaft drop too hard or pinch fingers. The case should easily come apart. If not check that all eight bolts and the one small one that hold the oil pickup are all removed. As you remove the case half away, the lifter may fall out. Throw those away.

Now you should have the two case halves, a camshaft, and a crankshaft on the table. (keep all those for now....)

It is time to start separating out the parts and preparing them for the work to come and plan for the final goal of a working aircraft engine.

In Summary: For A **SPYDER** Conversion Engine keep these parts for cores…
Case and case bolts
Crankshaft, gear, slinger ring, rear bolt and large washer
Camshaft
Rear Housing
Cylinders
Connecting Rods
Oil Filler spout
Heads
Pushrod Tubes
Pushrods
Rockers, Rocker Plates, Rocker Studs
Valve covers
Oil Pickup
Distributor
Baffle Tins
Rear TIns

END…

CHAPTER 3

THE PARTS

Here is a list of the parts that you want to keep and a baseline of the work to be done to them. This list is appropriate for the Spyder Engine Conversion process used on the 100 HP engines. Consider that these are our recommendations if using our IFB process.

Crankshaft: Will be used as a core if it passes checks for IFB Hub

Distributor drive gear: (brass) Will be used if wear is minimal

Oil Slinger: used after cleaning

Camshaft: Used for core value for reground IFB Cranks

Camshaft Gear: Not used

Bearing shells: Not used

Lifters: Not used

Case Bolts and Nuts: Used – Cleaned, inspected and painted

Left and Right Case halves: Used – cleaned and processed for IFB

Accessory Housing: Used – Clean and modify for Alternator

Distributor: Used for core – Modified for Aircraft use

Cylinders: Used as cores

Pistons: Removed from rods and thrown away

Connecting Rods: Used as cores

Heads: Used for cores or rebuild if condition and type allow

Pushrod Tubes: Used – clean up and paint if condition is good

Pushrods: Used – Clean and inspect

Rocker Plates: Used – Clean and inspect

Rocker studs: Used – Clean and inspect

Rockers: Used – Clean and Inspect

Cylinder Baffles and Clips: Used – Clean and inspect

Valve Covers and Clips : Used – Clean and prepare for Oil Filler/Breather

Rear Tins: Used – Clean and prepare for use

Oil Pickup: Used – Core for modification for deeper pan

The rest of the part can either be sold to a car guy that may want the, especially carburetors, alternator and other good engine parts. If not be sure to recycle them at a local scrap yard…you may even get a few bucks.

As far as the initial cleaning of steel parts, a good oil based cleaner works well, such as mineral spirits or Varsol. For the aluminum parts I have used a cleaner such as Purple Power or any good degreaser from an auto parts store. You will also need plenty of elbow grease at times.

More details will be in the next chapter as we go through all the parts to be prepared.

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CHAPTER 4

THE CASE PARTS

In this chapter we will work through the Case section of our build. This includes the crankshaft, camshaft, and case.

CRANKSHAFT: Will be used as a core if it passes checks for IFB Hub

The crankshaft we use on the 100HP Spyder Conversion is the Stroked Late Model that has a 8409 raised number on one of the flanges of the crankshaft.

The crankshaft is probably pretty dirty and oily when it is removed from the case. Clean off with and oil based cleaner such as Mineral Spirits or Varsol. Blow dry with air. Remove the gear, spacer, and slinger if still on the end. A small three arm puller will work.

One check to do on the crankshaft is to suspend it from the end and tap the bottom near a rod journal with a steel hammer lightly. It should ring like a bell. If it doesn't, try suspending it differently and try again. A crankshaft that does not ring but has a dull thud to it, it is probably defective and has an internal crack somewhere. A good crankshaft will ring true. If it passed this test, lightly coat it with oil and wrap in plastic. You can send it to us for processing.

What do we do? We take your crankshaft and run it through several inspections. First we determine if it is good to use by a ring test, measuring journals and checking for a nitride mark. Some crankshafts were nitrided from the factory and have a "&" stamped on the end of the six bolt hole flange.

If the crank is nitride and the journals all measure Std. and are in great shape, we can sometime use it as is without grinding. The flange and gear are then removed from the crankshaft. We chill the crankshaft in the freezer, heat up a new prop hub and press the prop hub onto the chilled crankshaft with a 40 ton press. Once the hub is installed, the crankshaft gets set up in a crankshaft grinding machine where the prop hub bearing and thrust flanges are ground to size. The Prop hub circle is also trued to the crankshaft to insure the propeller runs true and accurate. The crankshaft is then polished and prepared for installation.

Some basic crankshaft dimensions:

Main Journal: Std. 2.098-2.099” or .010 2.088-2.089”

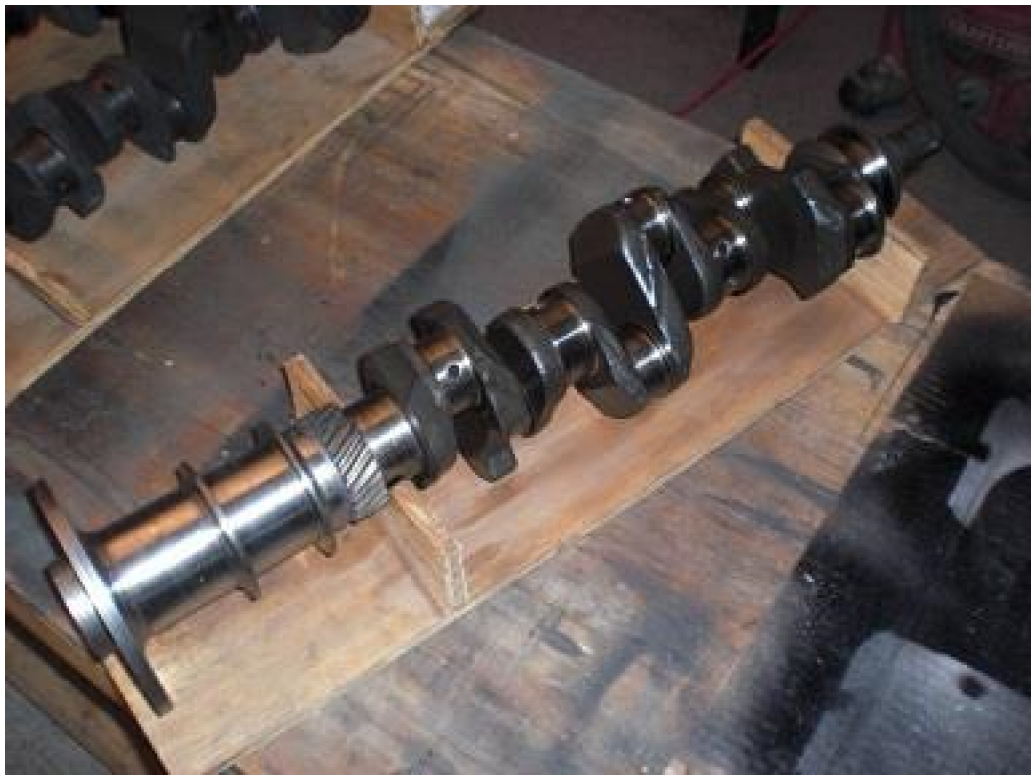
Rod Journal: Std. 1.799-1.800” or .010 1.789-1.790”

IFB Journal: Std. 2.449-2.450” or .010 2.439-2.440”

If the crankshaft is not a nitrided version we will measure the journals. If they are standard size we can use this for a core. If it has been ground .010 we don’t typically use it. We chill the crankshaft, heat the hub and press the hub on. We then grind the entire assembly .010 under for the mains and rods, machine the hub and thrust flanges, and true the prop hub. Then we send the crankshaft to be Nitrided at another facility. When it comes back, we inspect it and then polish the journals. Once through this process the crankshaft is ready for installation.

Pictured are crankshafts showing our IFB Hub process….

If you are storing the crankshaft for any extended period of time, spray it with a good oil and then tie it up in a thick garbage bag to keep moisture from attacking it. Every month or so open up the bag and re-oil it.



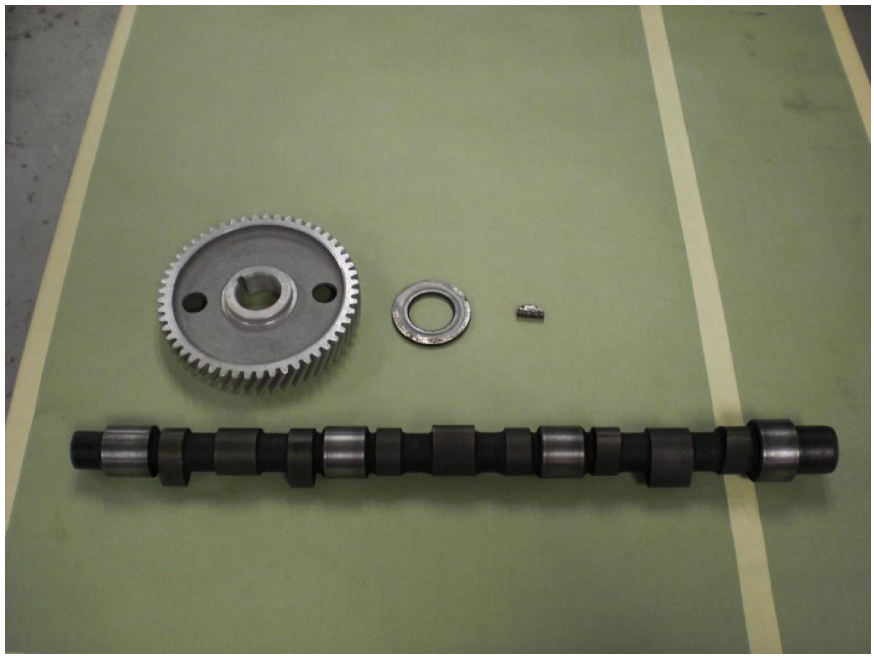
A finished crankshaft for a 100 HP Engine

CAMSHAFT and GEAR: Used for core value

Typically we order new camshafts and gears for the engines we build. We install the new gears and thrust washer in-house by heating them and chilling the camshaft and pressing them onto the camshaft. The core camshaft can be removed from the gear by using a press. The camshaft core is then sent in as core value against reground camshafts or for plain cash value.

The new camshafts are checked for accuracy and the gear is checked to be sure it turns true without any wobble.

As an option we can provide a fail-safe style gear that has a heated band on it. There is an additional cost typically for these gears.

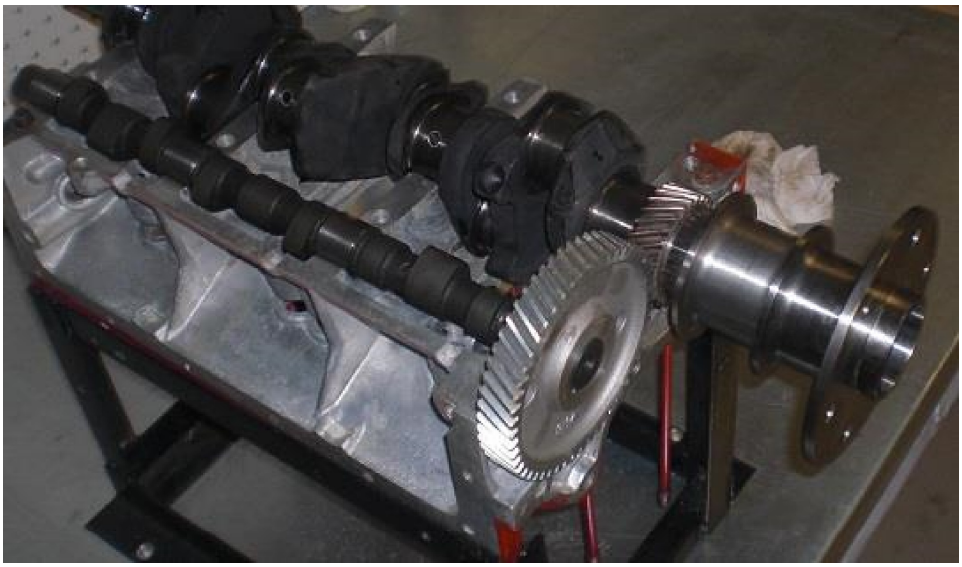


New Camshaft prior to assembly

Thrust washer and Woodruff Key installed into camshaft.

The camshaft is chilled in a freezer to allow it to shrink slightly. The gear is heated to about 450 degrees and pressed onto the chilled camshaft. The press keeps the gear tight while cooling.

Camshaft gear pressed onto the camshaft in press.



Camshaft and gear being checked in case for wobble and fit.

Once the camshaft is assembled it is wrapped carefully to protect the gears.

ENGINE CASE: Used for build.

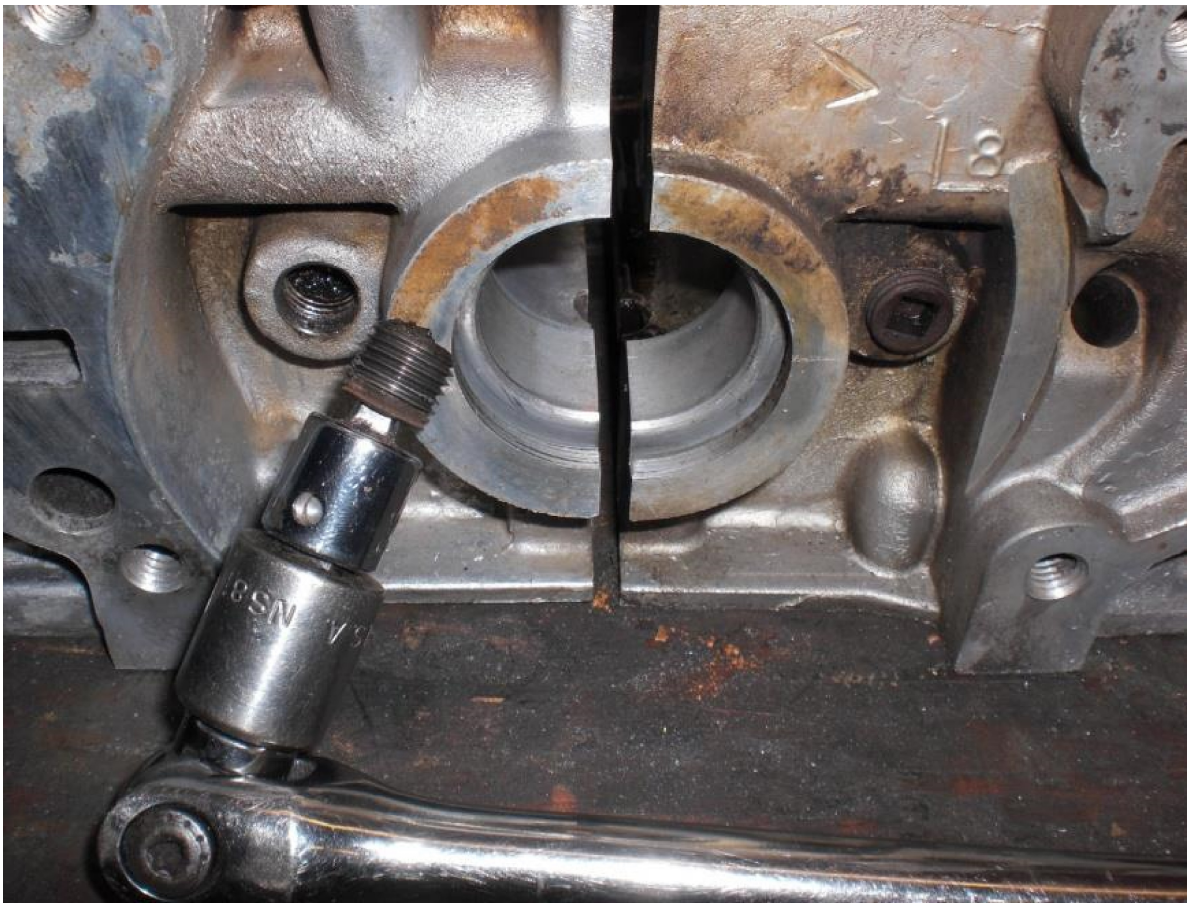
Most customers send us their case for us to process. Here are some of the steps we go through to get it ready. You can save some time and money by cleaning and inspecting the case yourself and catch any major issues.

The case halves are separated and cleaned. Options for cleaning are to drop them off at a machine shop where they can clean it with a heated, pressurized cleaner similar to a large dishwasher. You can also clean yourself using a soft brush and a quality de-greaser with lots of elbow grease. We find it better to clean by hand and and end up with a better result. Block boiling works well too. Final results are important. Once the case is cleaned we can inspect the case for airworthiness.

As you clean the case be sure to do so on a soft surface such as plywood to prevent any damage to the case bearing areas, cam saddles, or joining surfaces.

On the flywheel (or prop) end of the case you will find two plugs with 1/4" square drive holes. Remove these to clean the oil galleys (soft long brush). Remember to reinstall them with aviation sealant after final cleaning. Remove dipstick tube as well by tapping on the end of it with a light hammer. Use a small block of wood to place between the end of tube and hammer. You will be driving it out from the bottom of the case.

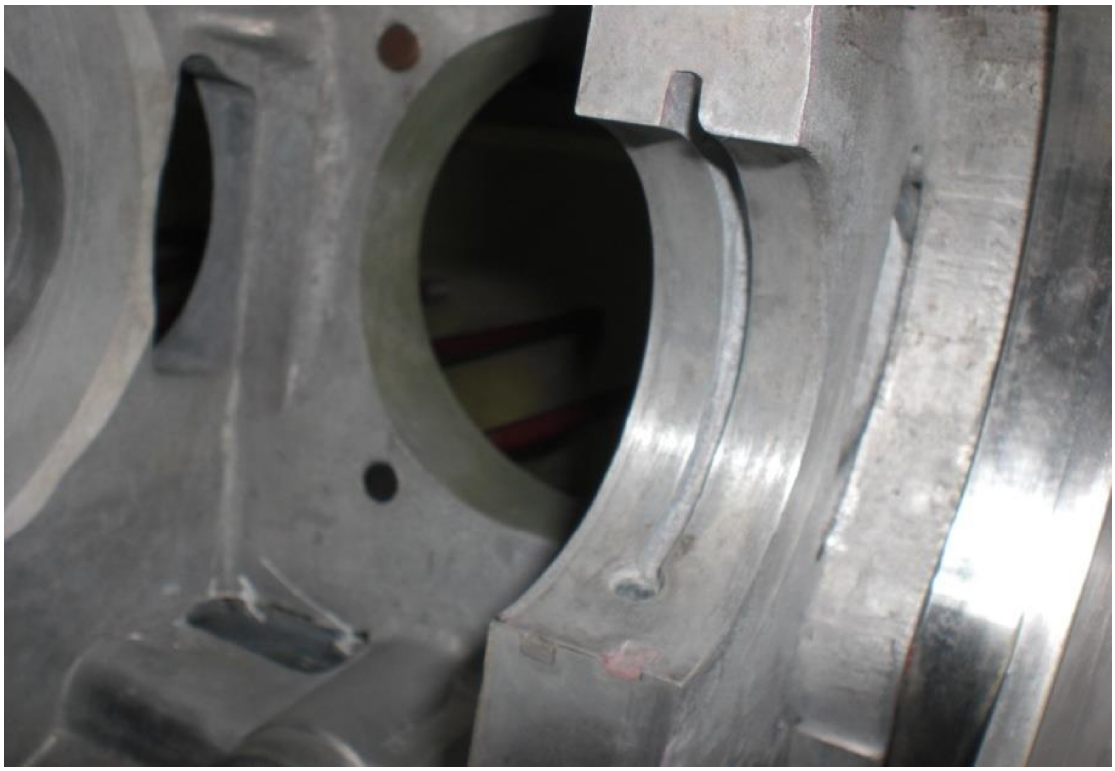
Bolt the case together with one through bolt near the cam gear area. Check the camshaft front bearing saddle to be sure it isn't out of round. Before you clean too much of the case it is good to check this as it seems to be the biggest culprit of bad cases so far. Use a telescoping gauge to check this. If you need more instructions please let us know.



Removing the Galley plugs… measure this cam bearing with block together

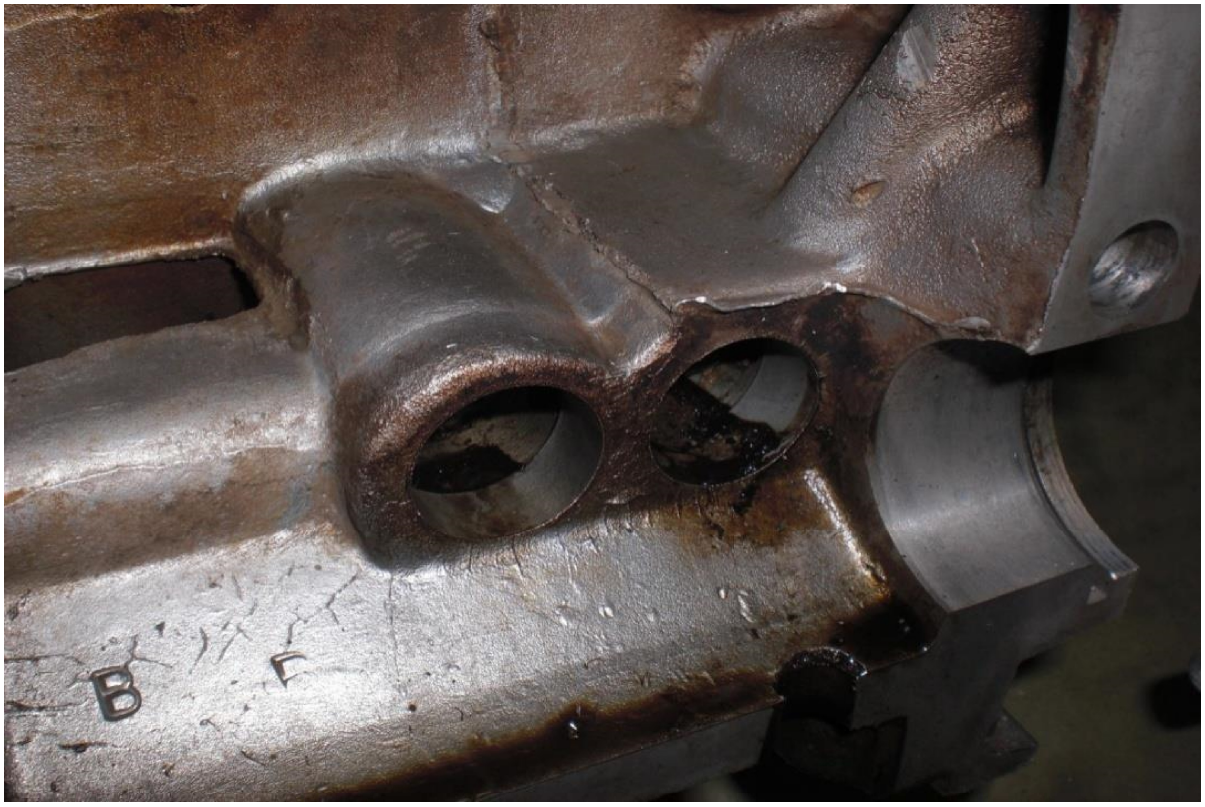
Inspect the case for overall condition. It is easy enough to see what should be normal by taking your time looking it over. Cleaning the case by hand allows you to inspect while you clean. There are surfaces that need to be treated carefully. These are the case mating surfaces, any bearing surfaces, cylinder seating areas, front and rear cover surfaces.

Check case bearing saddles for condition. Original diameter of these is 2.6406 – 2.6416. These are usually in good condition and suitable for use. We reassemble the two case halves and check for these dimensions and out of round.



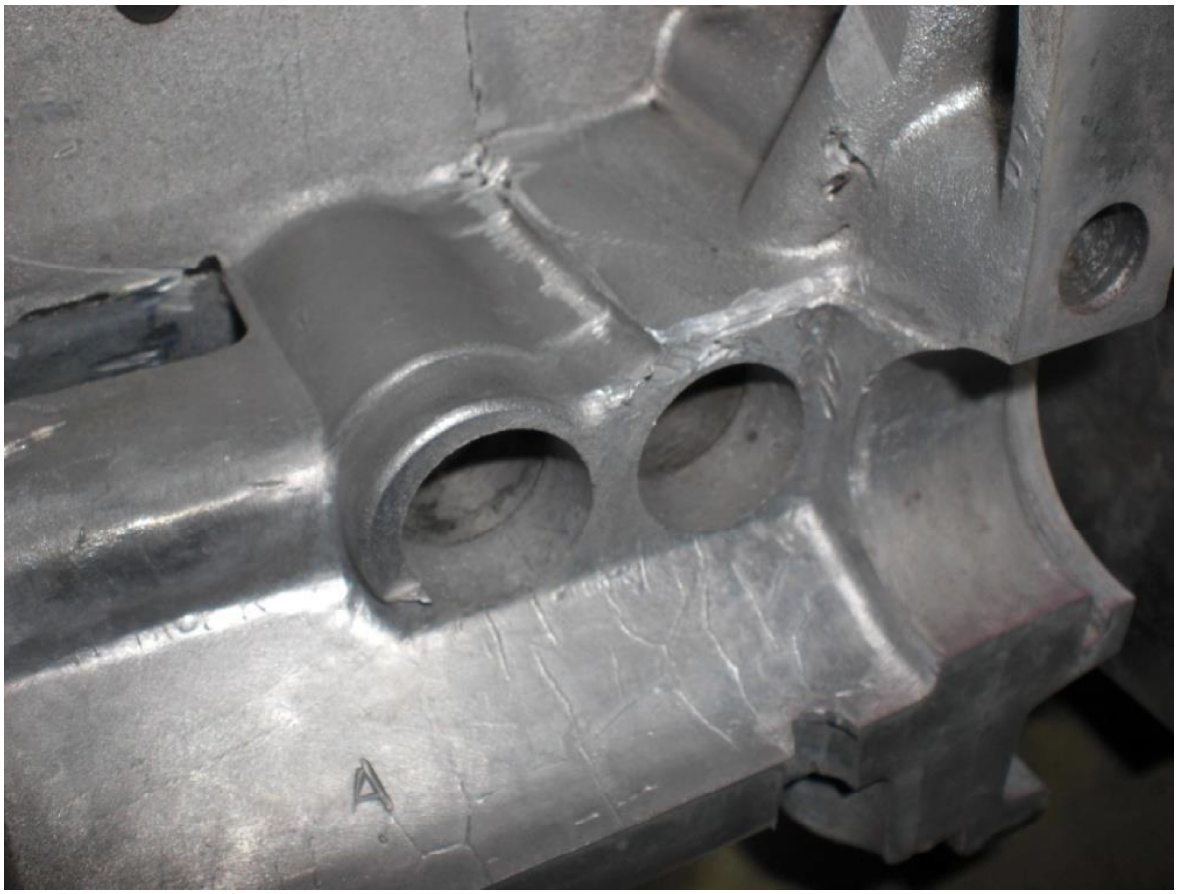
The corvair engine does not use cam bearings. The camshaft runs in the case itself but is very well lubricated. If the engine has not ingested large contaminates then these areas are usually in good shape. Look for smooth bearing areas. We check the cam journals for out-of-round as well. The main front cam bearing saddle has been found to be out of round at times. Be sure to check this if you do your own case.

We clean out the oil passages with a small bristle pipe cleaner to be sure that oil will flow properly to the bearing once assembled. If a case has been sitting out in the open insects such as mud daubers like to fill them up.



(Lifter bore area before cleaning and de-flashing)

The lifter bores are another area to check. You can use a new lifter and lightly lubricate it and insert it into the bore to check for play and wear. Visually inspect it as well for wear. That can show up as groves, lines, extruded aluminum and cracks. Once you start looking at all of them you get a feel for what is correct and a bad bore is easier to spot.



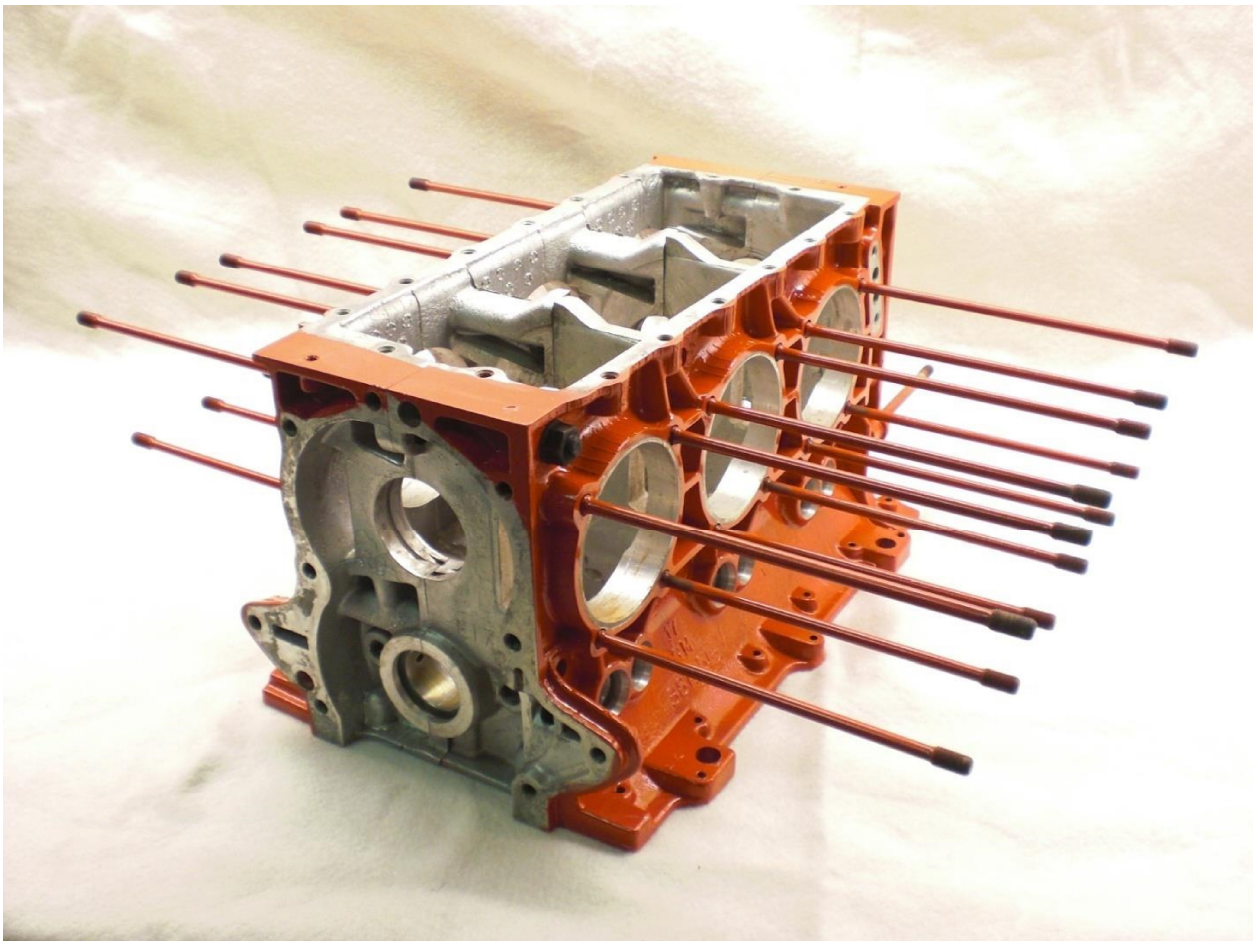
(a cleaned and de-flashed bore area – good cam bearing surface)

Any major issues with these areas are cause to scrap the case. Don't throw it away as it can be used for other purposes as well.

If no major issues are found with the case, then spend some time detail cleaning and de-flashing. There are little areas on the case castings that are sharp and can break loose and contaminate the oil. Around the lifter bores is one example. Use a Dremel or fine sanding disc and clean these areas.

One of the final issues to deal with on the case are the head studs. There are two sizes of head studs on the case. Long ones on the top and short on the bottom. Due to corrosion many studs can be defective. The top ones typically are corroded on the tips (worn looking threads) or along the shaft (pitting). Sometimes we see cases with near perfect studs and we just clean them in the case and don't try to remove them. More often we need to replace a couple or all of them. Use a double nut method to remove them. Heat (torch) may be necessary at the case to get them moving. Also soak the threaded in section with something like WD40 or a penetrating oil to help break the stud loose at the case.

Pictured are the head side of four head studs….left to right are ..First, a damaged and worn out original stud as you may find. Second is a cleaned original stud that is good for reuse. Third, is a new stud (difficult to find at times but can come with oversize case threads). Fourth, a new ARP Heavy duty stud. These are pricey and require a bit more case work to install. We evaluate the condition of the case studs and replace them as required. Normally we save and clean good original studs for use later. Sometimes the case will require an insert or repair for a replacement stud. There are a variety of ways to make these repairs such as helicoils or Timeserts.



A Cleaned and Prepared Case before the IFB Housing Installation

IFB HOUSING INSTALLATION:

Once the case is prepared we typically will mask it off and paint it to a customer's preference. We take care not to paint in areas where gaskets need to be located or seals are placed. Once it is painted, we place the case half in a fixture to hold it in place while we install the CNC'd IFB Front housing. An alignment tool is installed into the case and the other half is installed and torque to specifications. The IFB Housing is then installed onto the case. Once the IFB Housing is installed and torqued, the case halves with the housing halves can be disassembled. The case is ready for assembly.

Finished Case halves with IFB Housing and Prepped Crankshaft.

Case Options

There are a couple options on rebuilding a case. Your choices are dependent on the purpose of the engine. For most aircraft engine combinations we have chosen to stay stock as much as possible. There is good history on case performance and we have had good success with this direction.

ARP case studs.

There are heavy duty ARP case studs available that hold the cases together tighter and in better alignment. These require a reamer to ream the case bolt hole out slightly, The new case bolts are thicker in the middle and act as an alignment

pin. They do require substantially more work and are costly but should be an option on extreme performance engine. For most low RPM engines (aircraft) they are not necessary. The original bolts work quite well.

Boring for bigger cylinder.

If you plan on using any of the new over bored or VW cylinders you may need to machine the case. This would have to be done on a precision mill. Instructions would be provided with the cylinder kits.

ARP Head suds.

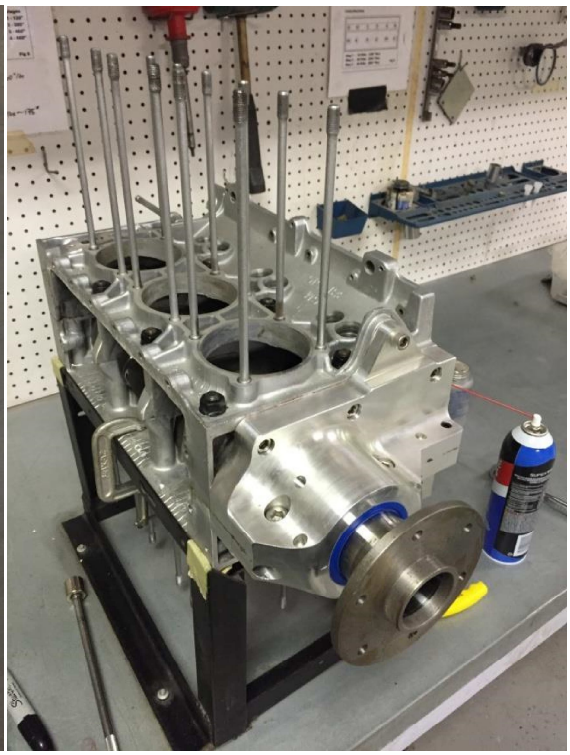
Nice and clean head studs. A bit costly. All that is required is to drill and tap the case holes for the bigger thread. We have not found them necessary for most purposes. A good original stud works very well. Installation instructions come with the kits.

IFB Housing.

Our Integral Front Bearing Housing is a CNC'd part that is installed to a clean case in preparation for our Integrated Crankshaft design. The housing can be installed to your cleaned case at our facility for proper alignment. Once installed the case can be split for assembly. This housing transfers the propeller loads to the case better, supports the crankshaft with a large common bearing, and moves the trust loads to the front of the engine. Call for information.

Be aware that our IFB design is made to incorporate our rear starter and alternator kit as well. The IFB will require an oil feed line that runs up along the top cover and is fed from the back of the motor near the rear starter. Look at finished pictures to visualize the final parts.

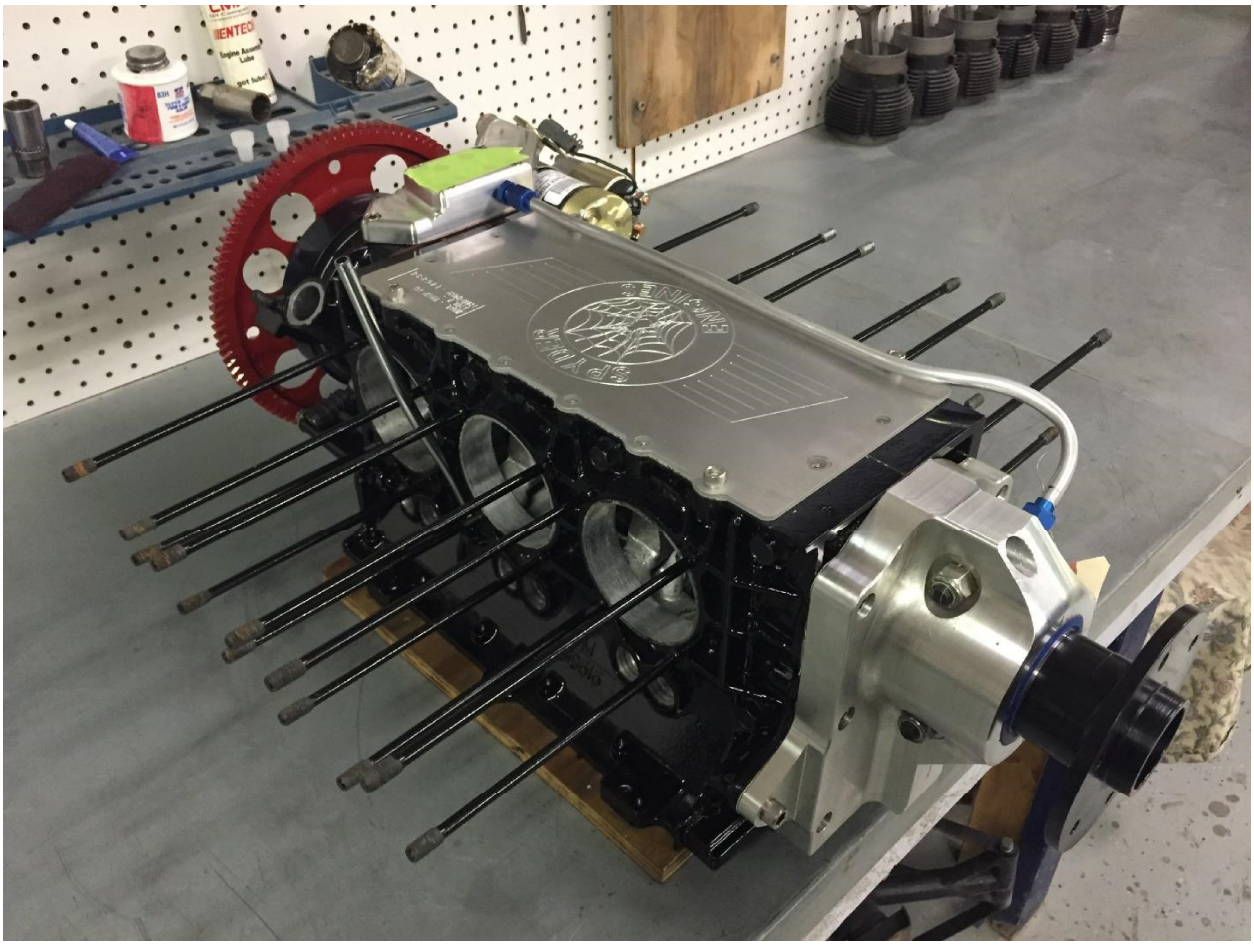
IFB Housing in the rough.



Shortblock during final Assembly

SHORTBLOCK ASSEMBLY PURCHASE:

If you are choosing for our shop to build your shortblock (or prepare an engine Kit) you will need to ship or deliver you core case, crankshaft, and camshaft to us along with the case bolts. It is best to lightly assemble the parts into the case and build a sturdy crate to ship it to us. Contact us for shipping arrangements. You may also choose to wait until we ship you out a shortblock and then return the core in our shipping container. Again, contact us for options that may work best for you.



A completed IFB Shortblock with rear starter and alternator

CHAPTER 5

The Rear Housing

The rear housing is one part that we use in our conversion that is modified to use our rear alternator design. As such we will require a core in order to prepare it for the changes.

Here are some steps that you can do to clean and inspect it.

A couple housings as they were sent to us before any cleaning.

When we receive a core as pictured, it will disassembled first. The six oil pump cover bolts are removed and thrown away. We remove the pump cover and retain for later. We remove the oil pump gears and dispose of them. The oil pressure regulator bolt is removed along with the spring and plunger. We keep these for later as well.

If the Delton housing is still attached (the part with the oil filler tube) we remove that and keep for either a core for a car alternator or remove the oil filler tube for a valve cover modification. (see valve covers)

The fuel pump rod and spring are removed from the housing. The pump rod bushing is driven out with a removal tool. The oil bypass spring is removed. If the rear seal is still attached that is removed and thrown away as well.

Now we have the bare housing to deal with.

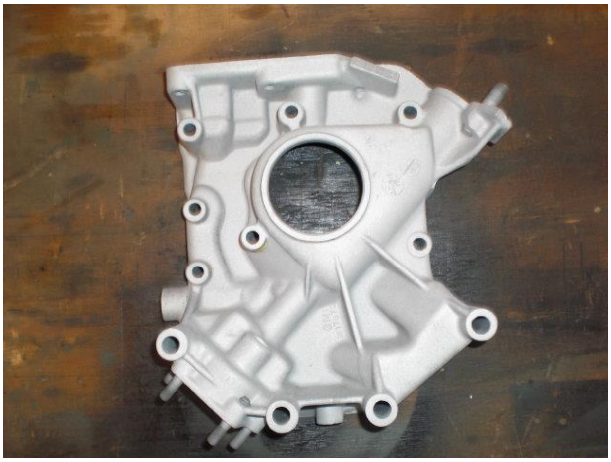
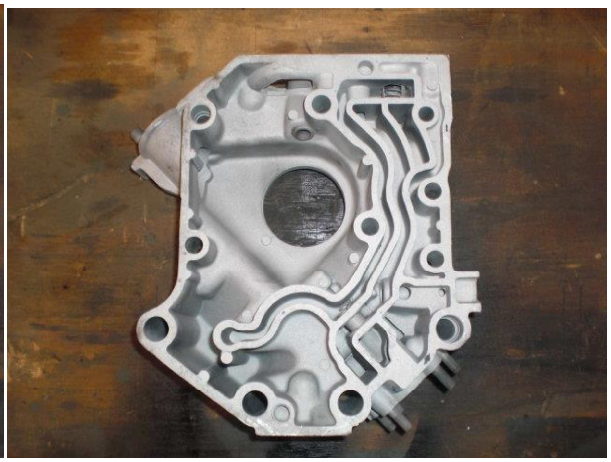
Oil pump, regulator and Deltron housing removed.

A disassembled Housing before cleaning.

The housing is soaked in a parts washer and cleaned using a soft brush and scrapers as necessary to remove any grime, dirt, sludge, and old gasket material. Take care not to damage any of the mating surfaces. Look for any cracks, damaged areas, or questionable issues. We sometimes find cracks or missing pieces at the lower through bolts. We can repair and mill some rear housings.

Once we have it fairly clean we will wash it with soap and water and use shop air to blow dry it.

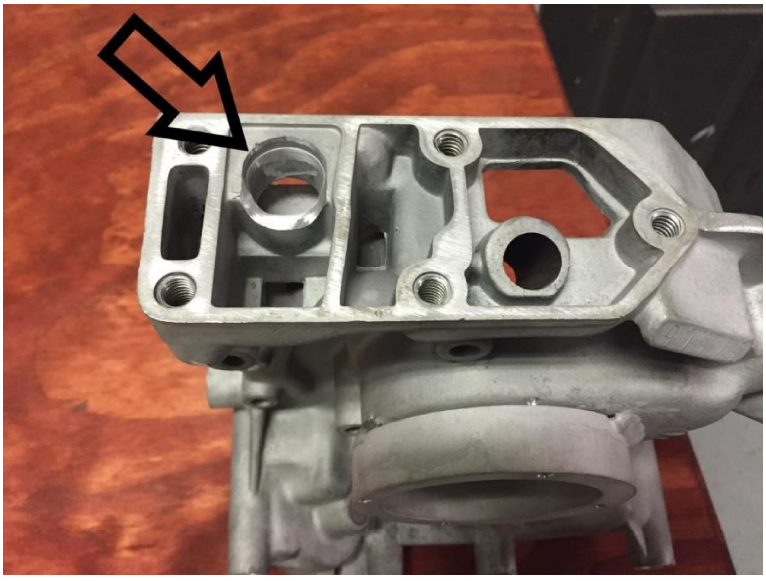
The housing is then blasted in a blasting cabinet using walnut shell, soda, or any other good agent that does not damage the aluminum.

One of the rear housings after cleaning and blasting.

We wash the housing again after the blasting and blow dry. All the bolt holes are cleaned out and threads are re-tapped and cleaned.

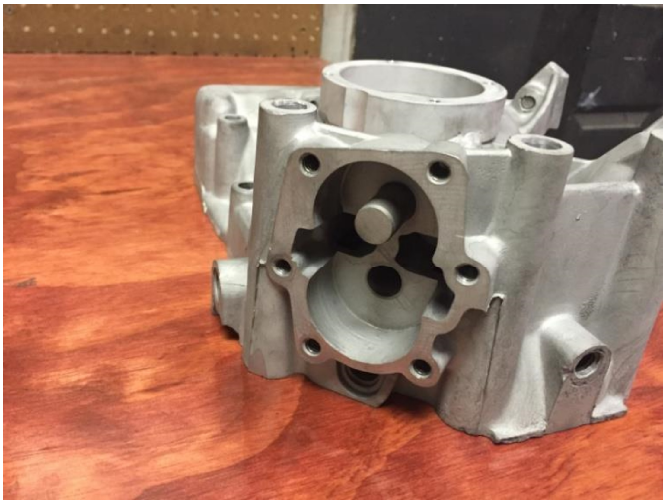
Oil Flow changes: We remove the bypass valve that was located in the top of the housing and use a high speed mill bit to open up the area through the “pre-case” oil flow passage. This is necessary for our rear alternator and starter design. See arrow in picture below.



OIL PUMP and REGULATOR:

We check the oil pump shaft and gear area for any corrosion and major scoring. If the area looks clean and usable we prepare it for customer needs. Sometimes we install a high volume oil pump. Follow pump directions that come with those kits. We have had success using a standard and high volume pumps.

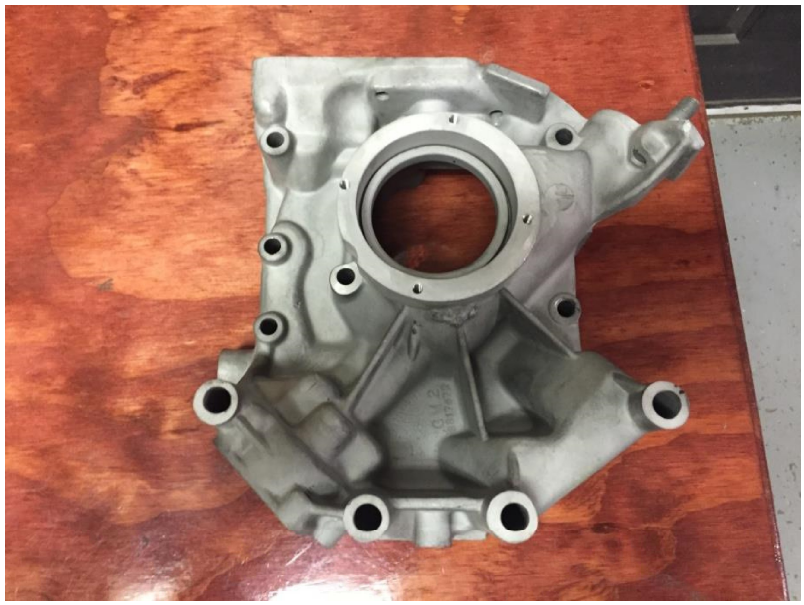
The oil pressure regulator piston needs to be polished up with a scotchbrite pad. Use a little oil and insert it into the regulator port using a wooden dowel so you can rotate it and insure that it moves freely and smoothly. Remove and clean the port and piston.



Cleaned pump area.

Rear Alternator Preparation:

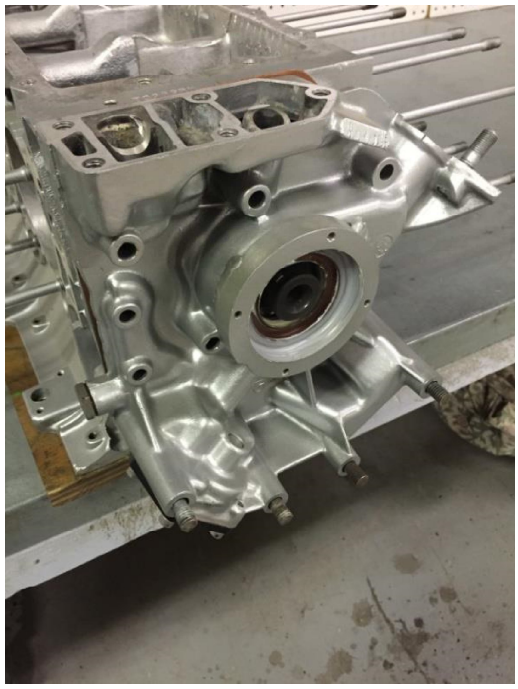
In order to install the stator for our rear alternator we have to weld a ring onto the rear housing and machine it for proper alignment. After cleaning the housing we install an alignment fixture and weld the ring to the housing using a TIG machine. The housing is then machined and drilled for the stator. We also surface the mating flanges to the case, the starter bracket and oil pump with a flat surfacing table. This helps insure a good seal when installing the unit.



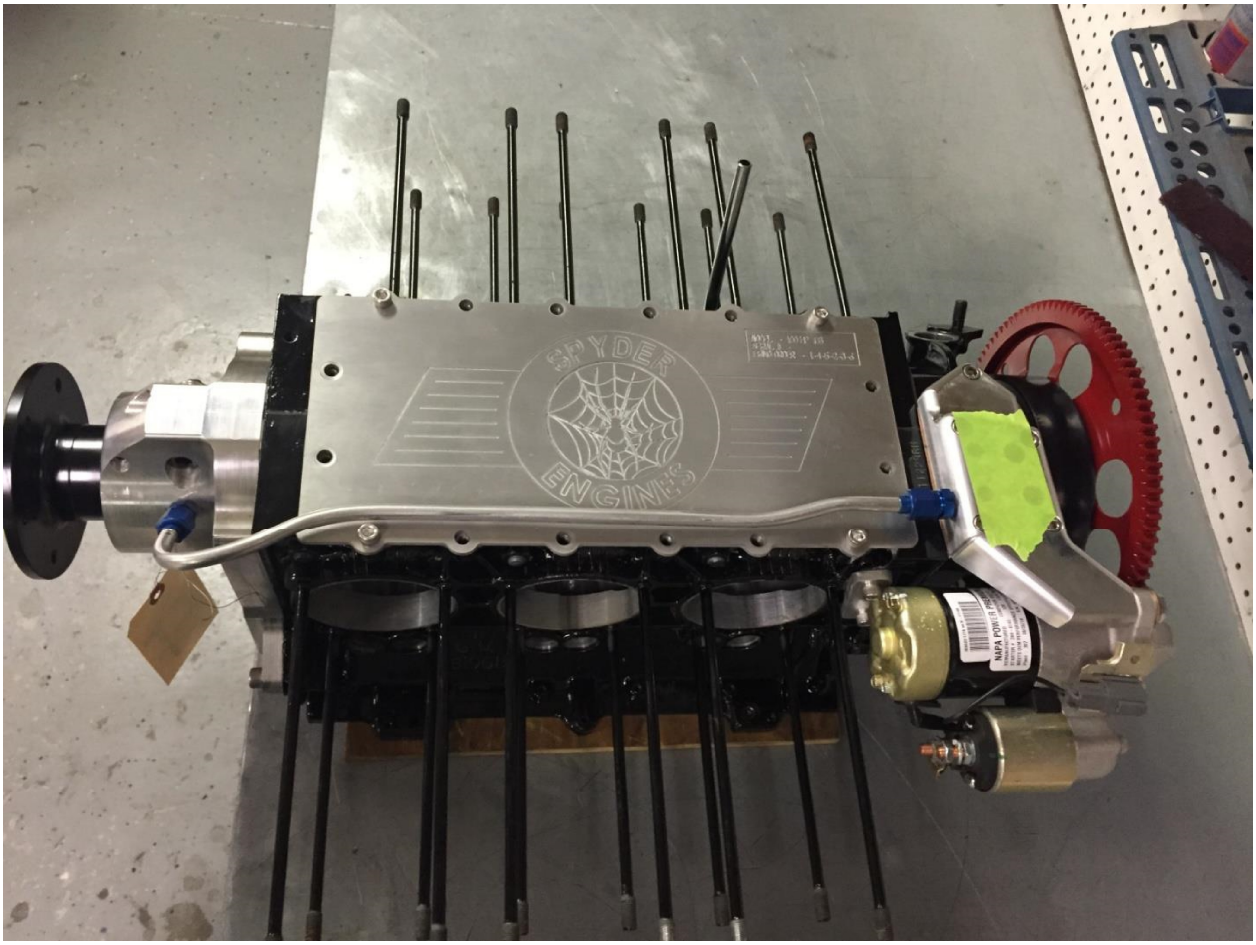
Alternator Ring welded and milled for stator installation. The unit is now ready for final assembly or shipping.

SHORTBLOCK:

If you choose, we can paint and prepare the housing to be installed onto you shortblock. Let us know your preference. This way we can insure proper alignment and installation.



Fully Assembled Shortblock ready for customer:



Picture showing Shortblock with 32 amp Alternator, starter, Spyder top cover, IFB and pressure oil line. It makes for a very clean and simple installation into your aircraft.

CHAPTER 6

Small Parts and Cores

In this chapter we will tackle most of the minor components and what we do with them as well as some of the work you can do.

Cylinders: The Corvair cylinders are typically used as core for rebored units from companies such as Clark's Corvair or California Corvairs. Any number of small engine machine shops may also have the ability and tooling to bore and hone the cylinders to new dimensions for oversized Pistons. As a norm, we have all our 100 HP base engine cylinders bored to .040 oversize.

When we receive your core cylinders they are inspected for damage. Clarks will only take "near perfect" cylinders. They have to have zero damage to the head surface area and no broken fins. Be sure to send "late" cylinders that have the slot cutout on the bottom.

Before and After Pics of Cylinder Cores – Note the slot at base

After the rebored cylinders are returned from the machine shop we prepare the cylinders for aircraft use. The Cylinder fins are quite rough looking at time and can be full of small particles left over from the casting process. We use a high speed cutoff wheel to clean between the fins to the barrel. As pictured below, we also use a Roloc Disc to smooth out the exterior of the fins slightly. The goal is to improve the air flow through the cylinder fins.

After grinding out the crud and smoothing the cylinders you will need to clean them well. Wash them well in Varsol or mineral spirits to remove the casting dust. Final clean the exterior with Carb or Brake cleaner and blow dry with shop air.

Tape off the cylinder base and top section. Use a black paint such as Dupont's Engine High Temp Spray Paint DE1635 to paint the fins. Black paints tend to radiate heat better. Apply about two medium coats for good coverage.

Remove the tape once the paint is dry. Apply Engine oil to a clean paper towel and wipe the inside and unpainted portions of the cylinder to prevent oxidation.

Prepping the Bored Cylinders for Paint.

Connecting Rods:

The connecting rods will need to be sent to Clark's Corvair or similar shops for overhaul or core value. First we will need to remove the connecting rod from the piston.


Piston Pin Being pressed out

We use a 20 ton Press and special tools to hold the piston in place while a drive pin pushes the wrist pin out of the rod. Once this is done the piston is thrown into a recycle bin as “dirty aluminum” and the pin into a steel recycle drum. The rod is then checked for core value. Be sure the appropriate rod cap is installed and bearing shells removed. The rods have numbers stamped on the cap and the rod. These numbers should face each other and match. Install the two nuts as well. Wrap all six rods together to ship out.

Rod Removed from Piston

Stamped Rod Numbers

Rod cores and returned Reconditioned Rod set

If ordering rebuilt rods, it is advisable to purchase rods that are processed and balanced. As a rule, we also get new ARP rod bolts installed and have the rods lightened. It costs a bit more but is the highest quality in a rebuilt rod.

We also can purchase brand new forged rods that are of good quality and just get cash core value for the core rods. Either direction you choose works well.

Reconditioned Rod and New TRW Piston before assembly.

PISTONS:

We normally take our piston cores to the recycle center. They can be sold as "dirty aluminum" because in the piston is a steel reinforcement. Be sure to remove the rings and throw those away if you choose to recycle.
There are a variety of new pistons available. Our recommendation is that you always use forged pistons of high quality. TRW, Sealed power, Clarks, and other companies sell good quality sets. Typically you will pay about 350.00 for a good set. Be sure to match the oversize of your pistons and rings to your cylinders.

Removed piston (junk) and New Sealed Power Piston P/N L2206F .040

Pushrod Tubes:

Pushrod tubes are one of those items that we find many that have to be thrown away due to damage from heat, corrosion and improper removal. Don't use any tubes that have plier marks, bends or rough corrosion on them. Most of the tubes will have two little dimple marks on them from manufacturing. This is normal and ok on the tube. Maybe swap out mediocre tubes to car guys if usable there. We care extra tubes if you need some.

Once the tubes are sorted as to core use we remove the o-rings (junk) and then clean the tubes in a wash tank. Scrub the exterior and interior well with a

scotchbrite pad and pipe cleaning brush. Blow dry the tubes with shop air. We choose to media blast the tubes to get them very clean. Spray down with carb cleaner to remove any blasting residue. Tape off the ends. We now give them a coat of Zinc Chromate primer and put into storage or continue on to painting them with a high quality automotive paint such as an epoxy or urethane. White or silver is a preferred color to use for these part.

Pushrod tubes through the process of cleaning and paint.

Pushrods:

Clean the pushrods in a wash tank with mineral spirits or Varsol. Use a scotchbrite to wipe down the exterior. Run tank fluid through the center of the pushrod to verify that fluid passed smoothly and without restriction. Fluid should also stream out of the little side hole. Run fluid in bother directions to verify you don't have a piece of trash inside that could act like a check valve.

Cleaned pushrods and prepared rockers

Blow dry the pushrods and inspect them. Look for nice smooth ends – no corrosion allowed. Check for a bend pushrod by rolling on a level table or glass pane. A bent rod will wobble.

Wipe the rods down with oil to prevent corrosion and put into a baggie for later.

Rockers, Rocker Plates and Studs:

The rockers that came with the Corvair are very well built and if serviceable can be reused. We clean them and inspect them for undue wear and corrosion. Check the ball socket for too much wear by feeling any groove that may be present. Look at the area of the rocker that pushes on the valve stem for wear and pitting. Any bad rockers are thrown out. After washing them we media blast the rockers to clean them up.

We take a good rocker and use a high speed grinder to clean up the stem contact area. This has to be done carefully because this area rotates on the valve stem. After regrinding the profile the surface is polished to allow for smooth operation.

Removed rocker and prepped rocker

Note the stem contact surface area before and after prepping.

There are new rockers available through Clarks and other Corvair outlets. Do your homework concerning quality and manufacturing. Although similar, they are not the same as Small Block Chevy Rockers due to the drilled hole by pushrod socket.

You may also choose to use roller rockers instead of standard rockers. We have used them to good success but don't notice any real difference in performance in our application.

The Rocker Plates just need to be checked for corrosion and damage. We media blast them, clean them, lubricate them and put them into a baggie for later..

The Rocker Studs are also cleaned and washed. Here we check for any damage to internal or external threads, corrosion, and any nicks on the stud shaft. Light wear is ok (shinny spot) but any nicks are cause to throw away. A nick can develop into a crack and broken stud.

Rocker plate and stud before and after

Rocker stud showing light corrosion and light wear on stud. This will clean up fine. Any pitting or nicks are cause to throw away.

Rocker balls and nuts are thrown away and replaced with new.

Valve Covers and cover holder:

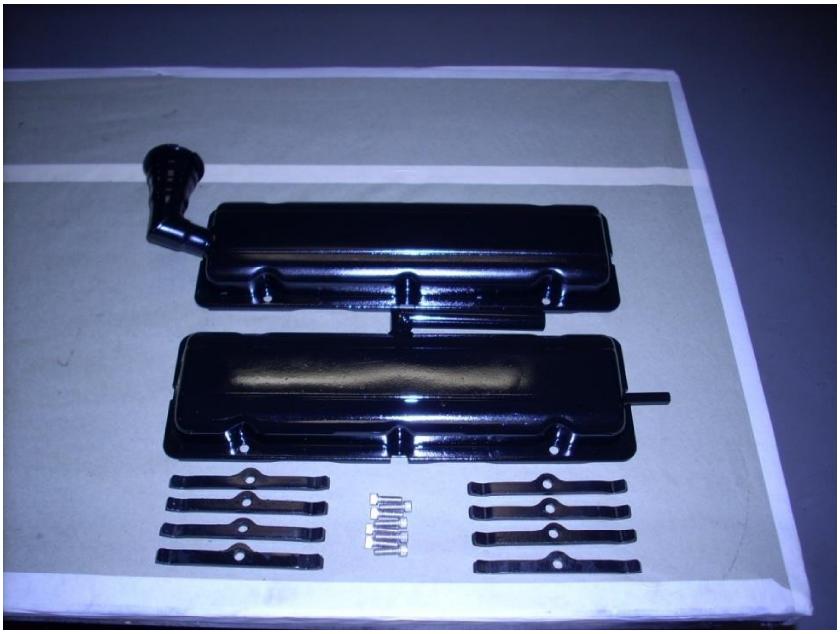
Valve covers are checked for corrosion and damage for preparation for use. Any big dents or pitting are cause for rejection. We clean the valve covers and holders of any grime and dirt. The parts are then media blasted to get a clean surface. The parts are now primered with zinc Chromate for storage.

Filler port removed from Deltron Housing

Process pictures showing before during and after preparation and welding.

In the case of the valve covers, they have to be prepared for aircraft use. As a standard, we add the oil filler port to the right side valve cover and breather ports and return line to the left side valve cover.

The filler ports are media blasted, cut, and TIG welded into proper place. The breather ports are TIG welded into place. Any cleanup and repriming is performed.



Valve covers and Clips prepped and painted for aircraft use.

Cylinder Baffles and Rear tins:

The Cylinder Baffles and clips are checked for corrosion and damage. Remove all the grime and dirt and media blast. Primer with Zinc Chromate and paint to desire.

Similarily, the rear tins are also cleaned, media blasted and painted. The tin on the left side (where oil cooler used to be) will be trimmed to fit around the starter (if using our Rear Starter Kit)

Before and after of Baffles…Rear tins primered

Oil Pickup:

Check the oil pickup for damage and corrosion. It can be replaced with a new deep pan version or modified. We clean and modify the pickups we send out with our deep oil pan kits. If you want the deeper pans you can use several different versions that are available. Most are quite heavy due to casting but help stiffen up the case and protect the engine if set on the ground. Use caution on lightweight oil pans.

Our pan and oil pickup with hardware

Distributor:

The Corvair distributor has to be modified significantly in order to be used in an aircraft application. The Vacuum system is removed, distributor disassembled and cleaned for rebuild. We modify the shaft and housing to be able to use a ball bearing. The points plate is replaced with one that accommodates the new points and electronic pickup. The weights and cam are modified to change the advance curve for the engine application. Typically we use about 18 degrees of advance to attain 30 degrees total at 2600 rpm and above. We test all our distributors on older distributor machines to calibrate and break in the units before preparing to ship out. They will have a new gasket, instructions, cap and rotor installed when they reach your door.

We will require a core exchange for your distributor or charge you a core fee. If you give us a lead time we can also prepare one in a color of your choice.

Take care to follow directions for installation as the electronics are sensitive to reverse polarity. Follow recommended repair and exchange program as well.

Finished Corvair Distributors with points/Electronics pickups

CHAPTER 7

Corvair Heads

Corvair heads are a challenging part of the rebuild process for an aircraft engine conversion.

Here is a baseline of what we do with your heads you send us:

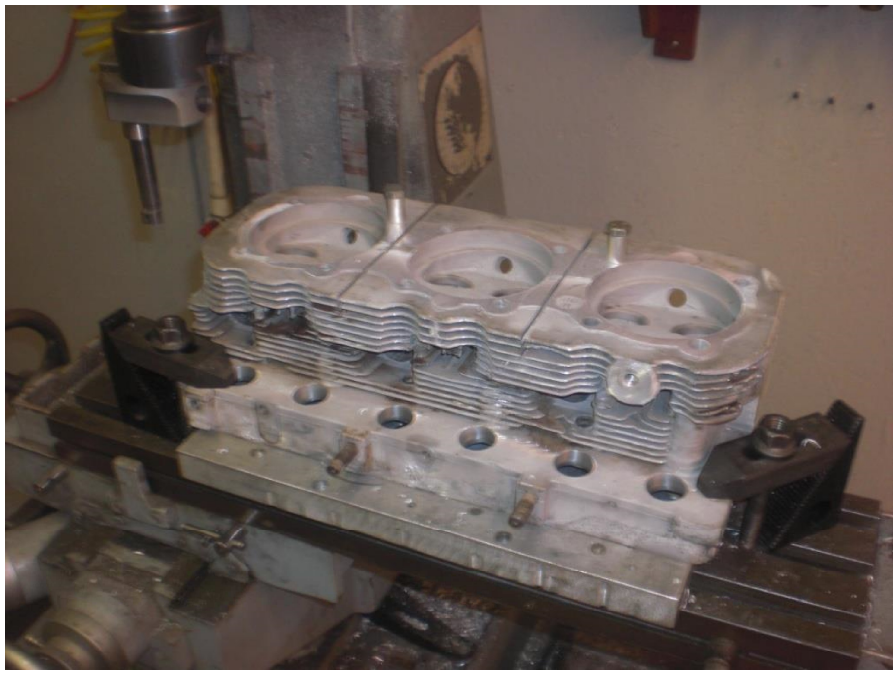
Remove valves and springs
Remove carburetor studs
Note Head casting number and type
Saw off carburetor flange
Heat up and remove exhaust down pipes, valve guides
Media blast and clean head
Mill top of fins, intake log
Mill valve cover surface
Mill cylinder side surface
Re-surface cylinder mating surfaces
Remove excess flashing and clean between fins
Prepare milled surface for intake pipe welding
Heat head and weld on intake pipe
Install new guides
Install new seats (if needed or requested)
Three angle valve cut and lap of valves
Install new valves/springs
Lightly Paint Head
Install cleaned/prepped down pipes
CC Head if necessary to recommend proper gasket thickness for application
Ready to ship

That is a lot of work on one part to get it ready but is necessary for the proper operation of the head. There aren't too many auto machine shops that do this kind of work but they are out there.

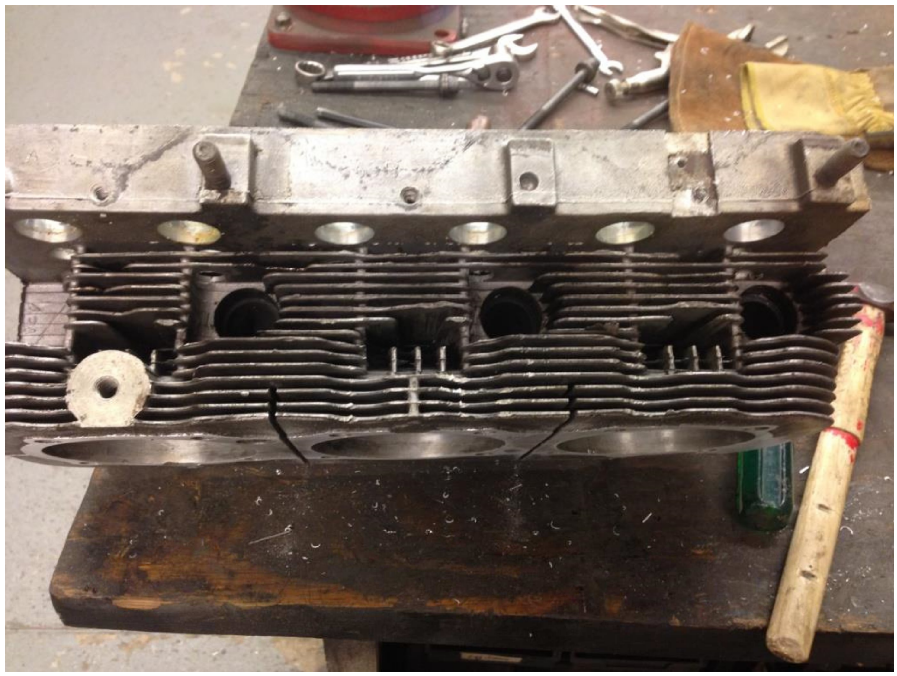
If your heads won't work on your application or they are damaged, contact us as we may have heads available or can exchange them.

Head being dissassembled

Top of head being milled



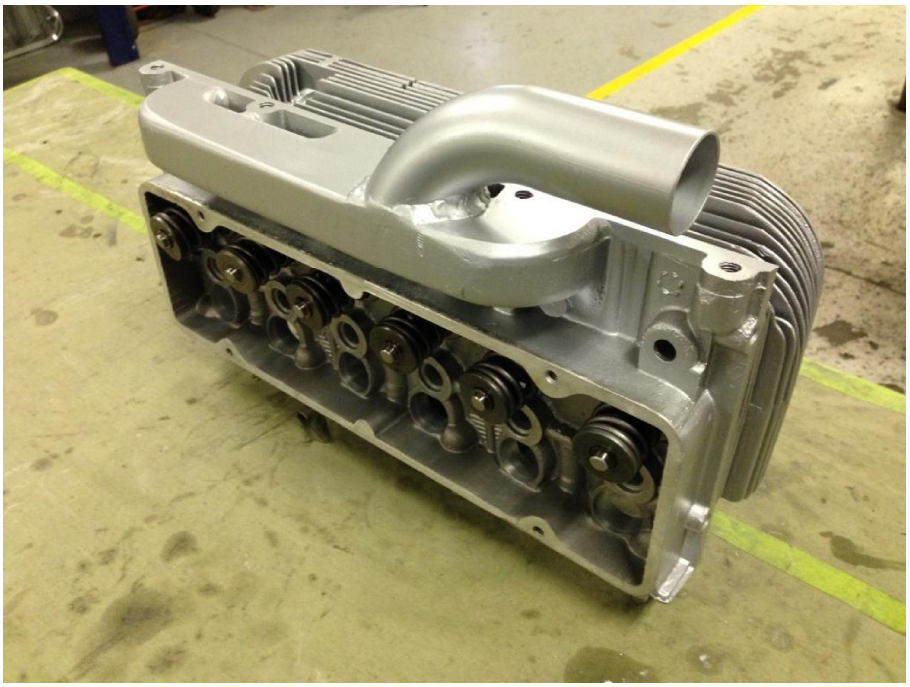
More head milling



Cleaning fins and deflashing bottom of head

A few of our 60+ heads..

Some heads in process lineup…



A finished left side 100 HP Head (originally a 1966 110 head) ready for installation

What do you need to know about Corvair heads?

There were a lot of corvair heads made for all the different applications of vehicles. The heads we want to be using are going to be primarily any 95 HP or 110 HP heads from 1964 to 1969. The heads have stamped casting numbers on the side were the valve cover attaches. Look for these numbers:

110s	95s	1964 110s
3856743	3856743	3819876
3856759	3878569	3886256
3878561		3856631
3878566		3886257
3883863		3856632
3778562		

There are some other numbers you will find in the Corvair Primer (a recommended booklet to use). Sometimes there are heads that you will find that aren't useful in an aircraft application but that does not mean it isn't useful. We have auto guys that need heads and can swap you out for them or can find uses.

If you heads are highly corroded or damaged beyond repair they may be good for mockups.

Save money by cleaning and deflashing your heads in preparation for overhaul. Cleaning is tedious and time consuming. It is much easier for us to work on heads that have been cleaned prior to arrival.

If you are going to do your own head work, study all the ins and outs of it. There are a lot of tools and tricks necessary to good cylinder head overhaul. Much of the machinery necessary is costly and required machine tool knowledge and experience to operate properly.

Study up on various websites for the many things that can be done to build good reliable heads. Contact us if you have any questions as well.

HEADS SUPPLEMENT:

There is a lot of information on line and in books on how to process and design heads that will work for your application. We have had extensive testing and trials done with various different head designs and horse power results. It is enough to say that the main drive we have in our head production is to rebuild the corvair head for long term reliability rather than highest power output capable. Yes, you could reduce the head compression and increase the ignition timing to gain a couple horsepower but you sacrifice in the margins of safety. If you decide to build your own heads be sure to study all the decisions and ramifications for what you decide to do. Lots of things can work but only a few work well.

Here are a few things we have experimented and tried to understand the robustness of the corvair engine and heads.

We have tried various compression ratios and cylinder chamber designs on several engines. Our results seem to lend to a few decisions that we use in determining the rebuild of the engine.

Most of the 100 HP engines we build are built using the 110 HP versions of the corvair head. We resurface the cylinder gasket area and leave at least .030 above the quench area (flat area of chamber below valves). With the appropriate gasket we look to achieve a 8.5-9.0:1 compression ratio. This works well with .040 oversize pistons. Keep the ignition timing to 28-30 degrees maximum and be sure the carburetor is properly adjusted or jetted and your temps will be within reason on climb out and cruise. If a head has been overheated it will show up as an indentation of the copper or steel head gaskets into the head surface. This can be removed with the surface milling process. However, if serious indentation is noted it may be signs that severe overheating has occurred. In these cases it may be advisable to replace all the intake seats. Intake seat are prone to drop.

If you lose an intake seat on a corvair you will experience @ 40% drop in power on the engine because not only do you lose the one cylinder but you will disrupt the intake flow into the adjacent cylinders on that head. If you lose an exhaust seat you may only lose about 20-25% of you power.

Intake seats and exhaust seat replacement requires special equipment and experience. Use experienced shops if you are going to have this done.

On our 120 HP engines we use modified 95 HP heads for the most part. Because of the higher displacement cylinders the heads require more open area in

the combustion chamber in order to achieve the proper compression ratio. Most of the 120 HP engines are set up with 8.5-9.0:1 CR. With the ability to CNC and CAD programs we are moving into the ability of designing and testing our own chamber profiles.

Our Turbocharged engines require a lower CR in order to operate properly as well as a reduced ignition timing. While we are still is testing (early 2018) and plan on having a couple customer engines out for testing, there is a lot to learn yet. We are using a CR of 8.0-8.5 max. and final timing at 24 degrees. We have produced some good results but these heads require a bit more precision in setting up.

If you have any questions we can help you through the head building process.

INSIGHTS AND CONCLUSION

By Bill Clapp

After building and flying my KR2S I knew there was much more I wanted to build and design. As noted, I have designs I am working on for a twin Corvair Aircraft. To get to that stage requires a lot more work but I hope to do much more aircraft building along the way. To date I have built the KR2S, modified a Sonex with our Spyder Engine and flown it to Oshkosh, built a W8/10 Tailwind with my wife and flown to Oshkosh, designed and built the Saberwing and more on the way. As of this date, August 2018, the prototype Saberwing has flown to Oshkosh four times, twice with the new Turbo conversion. Our first customer build Saberwing has flow to Oshkosh Airventure twice as well.

The Tailwind was featured on the cover the Experimenter with a very nice article by the EAA. Look for the Saberwing to be in Sport Aviation soon as well.

The Corvair Conversion has allowed me to accomplish many goals in my life and expand upon them. I hope that you will find inspiration to put forward the hard work and dedication to accomplish your goals as well. If we at Azalea Aviation can be a part of that it would make us proud.

There is much to learn and some days I feel as if I have just gotten started. It is good to try to learn something new every day. So…. Pursue your goals. Build your friendships and join the ranks of experimental aviation with gusto and drive.

Bill Clapp

Azalea Aviation LLC is an aviation based company and as such will work at helping support any aviation enthusiasts to our best ability. We understand that all builders are different and may have different goals. Our goal is to see you be successful and safe in your pursuit. Our capabilities include parts production, learning tools, Spyder Engine Workshops, Custom building and training, Flight training, and much, much more. Our staff is growing and learning how best to help you with your needs. Please give us a call or visit our website for more information.

Other Reference Materials Available:

Spyder Engine Assembly Manual 100 HP/ 120 HP

Spyder Engine Service and Operations Manual

Spyder Engine Installation Guide

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