Performance Corvairs

How to Hotrod the Corvair Engine and Chassis

Everything the engine builder needs to know to rebuild the Corvair for power in all applications from street to full race.

Covers all Corvair engines from 1960–69.

Seth Emerson and Bill Fisher

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Front Cover
1966 Corsa silver coupe, photo by Ned Madsen, Bush Stadium, Indianapolis, Indiana, 2008.

1965 Corsa engine compartment photo by Seth Emerson.

Back Cover
Dave Edsinger's #18 white and blue 1966 Yenko Stinger, photo by Rick Norris. Detroit, Michigan, 2007.

Seth Emerson's #46 yellow and black 1965 Yenko Stinger, photo by Dito Milian, gotbluemilk.com. Motorsports Photography. Thunderhill Raceway, Willows, California, 2012.

John Egerton's #6 white 1964 Monza, photo by Rick Norris. Detroit, Michigan, 2007.

Seth Emerson with Corvair-powered Lola T320, photo by Silicon Valley Corsa, Oakland, California, 1993.

Title Page
Seth Emerson #46 1965 Yenko Stinger, photo by Dito Milian, gotbluemilk.com. Motorsports Photography. Thunderhill Raceway, Willows, California, 2012.

Corvair Society of America
CORSA is a world-wide organization with 4,800 members and 125 local chapters worldwide. Founded in 1969, it is a large and enthusiastic group of automobile enthusiasts and one of the best single marque clubs in the world. The organization's monthly magazine is called the *CORSA Communique,* www.corvair.org

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About the Author

Bill Fisher

Author Bill Fisher got involved with cars early on. His grandfather owned Chevrolet agencies in Illinois and from age six he played behind the garage stringing old auto batteries together to produce more power.

His publishing career began in 1947 while pursuing a master's degree in education at the University of Southern California. As it came time to write his Master's thesis, he decided to combine his love of automobiles and English. He wrote *How to Construct a Hot Rod for High School Auto Shop Classes*. This thesis was the basis of his first published automobile book. Later, in 1948, he had a speed equipment shop in Eagle Rock, California and supplied speed parts to racers competing at Bonneville, El Mirage, and Muroc Dry Lakes. This was in addition to his flourishing mail-order automotive book business. Parts as well as books were sold to hot rodding enthusiasts across the country.

Bill was a huge fan of Chevrolet inline six-cylinder engines and when the Corvair came out in an opposed-six configuration he dug in to learn all he could.

In 1963, he founded HP Books (HP for horse power) and authored the original *How to Hotrod Corvair Engines* in 1964, revising it twice by 1969.

He loved motorcycles and cars. He rode them, tuned them, hot rodded, and raced them at the dry lakes. In 1981 he became a member of the Bonneville 200 Mile Club, breaking a record in his C Coupe at the Bonneville Salt Flats.

Acknowledgments

Bill Fisher passed away in May, 1999. These are his acknowledgments from the 1969 Revision III of *How to Hotrod Corvair Engines.*

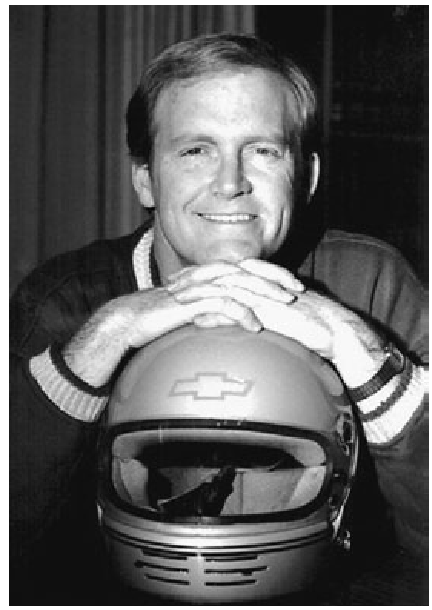
No book of this type is ever produced single-handedly. I am deeply indebted to the many men and organizations who have been lavish in their assistance, both in the writing of the original edition, and now in this revised version. The Technical Projects Department of Chevrolet Public Relations has provided outstanding help in answering technical questions, and in providing technical information and photographs that have been used throughout this book. Chevrolet's Merchandising Department has also been very helpful. GM policies prevent naming these gentlemen, but I am most grateful to each of them.

Over two years were spent in creating the original edition. This revised edition represents continuous digging and research into the use of Corvairs since the original was published. Encouragement from Frank McGurk of McGurk Engineering and Jerry Light of Vic Hubbard Automotive were especially helpful in keeping the original project underway. Three men have been especially helpful in providing information on their competition experiences with Corvairs: Don Eichstadt, Doug Roe, and Ted Trevor. They have helped me to make this revised version better in dozens of details. Special thanks is due to several friends: Angus McDonald for the original cover design, John Joss for editing advice, and C.E. Camp for invaluable technical advice on various aspects of mechanical engineering relating to high-performance engines.

About the Author

Seth Emerson

I bought my first Corvair in 1967, after exploding a clutch in my latest/last 1955 Chevy. My parents okayed a "Chevrolet OK Used Car" purchase, and even co-signed for the loan, as long as it wasn't a '55 Chevy. They figured it was so different than the other cars I had been modifying that I would leave it alone and concentrate on college instead. Sorry, Mom! I think I stopped in and bought an IECO catalog on the way home! In the last 45 years, I have raced Corvairs in every type and class of racing in which they run (except off-road racing), including SCCA autocross and road racing, drag racing, and rallying. I have driven Corvairs as street cars for many years, though not as my only car. My Corsa convertible still has the engine that my girlfriend helped me build. I am so thankful that I married her, 40 years ago. In the late '70s, I responded to friends' laments about the poor quality ignition wires available for their race cars by starting Silicone Wire Systems. I have supplied thousands of 8mm silicone ignition wire sets to most of the Corvair Parts vendors. I joined The Corvair Society of America (CORSA) in 1973, just missing the Anaheim, California, convention. By 1980, I was fully engaged and I haven't missed a CORSA convention since. I was a Corsa director for more than fifteen years and President of Corsa twice. I have driven



Corvairs to FTD trophies at conventions and placed a car into Senior Division Concours status as well. In short I have lived the Corvair life deeply over the past 45 years. I don't plan on stopping soon. And I will continue to research new ways of applying technology to our older cars. Why don't you join me?

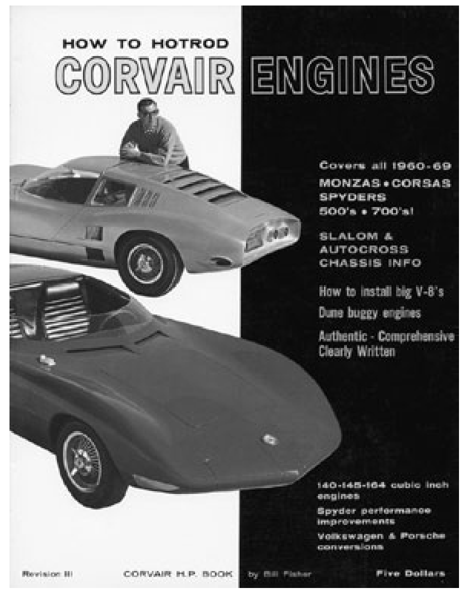
Acknowledgments

As Bill Fisher said many years ago, a book like this cannot be produced by one person. First Bill and then Howard Fisher supported my efforts in the update. Bob Helt and Richard Finch, both prolific Corvair authors, also encouraged me to complete the work. A big thank you goes out to those who are still building Corvair race cars and putting them on the track in front of an often skeptical public. The Corvair hasn't quite outlasted all of its critics, but it is well on its way to doing just that. Every time a Corvair puts the hurt on another car at the track, at the autocross, or even on the street(!), it validates Ed Cole's concept, Bob Benzinger and Maurice Olley's design, and countless Corvair developers from Bill Thomas to Doug Roe to Don Yenko to John Fitch.

To my Corvair friends, Bob Coffin, Chuck Sadek, Dave Edsinger, Rick Norris, Jim Schardt, Eddie Meadows, Warren LeVeque and a dozen others, your perseverance has always been my inspiration. Not only did you share your hot rodding techniques, you shared your cars with me at the track. I cannot thank you all enough, this is about the best I can do. My wife, of course, put up with my endless Corsa events, track trips, hours in the garage, and various amounts of money stuffed into Corvairs and "parts." Thanks Barbara, and thanks to you all. I hope you enjoy reading the book as much as I enjoyed writing it.

Introduction

The original *How to Hotrod Corvair Engines* (HTHCE) book was released in 1964. "California Bill" Fisher, a long time hot rodder and author had been enamored with the Corvair for some time. (Undoubtedly through his friendship with Ted Trevor, owner of Crown Manufacturing.) Bill had completed an engine swap of a Corvair motor into his Porsche 356 and was about to buy and drive a 1966 Corvair as his daily driver. The company that released HTHCE was called HP Books. The Corvair book was HP Book number one. The success of that book spawned a publishing empire that went on to publish hundreds of different high performance automotive titles, created a crockery cookbook series, and finally every other type of book for do-it-yourselfers. Ownership of the company, HP Books, changed hands a few times, but Bill, along with his wife, Helen; and son, Howard; continued to release books on varying subjects, including cars and car performance. The last revised issue of HTHCE, done in about 1973, was reprinted a few times by Corvair vendors, and hasn't been available for many years, except at swap meets. Back in about 1993, Bill and I agreed that a new revision of the book was needed. Because I was eager to write and he was busy with other projects, we agreed that I would update and rewrite the book, gathering in 20 more years of experience. The 20 years of experience has turned into 35, as other activities, both Corvair and otherwise, displaced much of my writing time. Progress was being made, however. And at the time of Bill's death in 1999, Howard Fisher, his son, and I agreed that I should continue the effort.



Ironically, the Corvair, for a car 50 plus years since first production, is still inspiring authors to produce books about it. As the cars age, authenticity becomes harder to achieve and preserve. When it debuted, the original HTHCE was the only book about Corvairs and the book covered the year-to-year differences in detail, at least from the performance point of view. Since that time, many books have been released to document what Chevrolet produced and how they went about building the cars. In this latest book, much of that authenticity data has been minimized, unless needed to indicate parts differences or sources. In short welcome to *Performance Corvairs—How to Hotrod the Corvair Engine and Chassis*.

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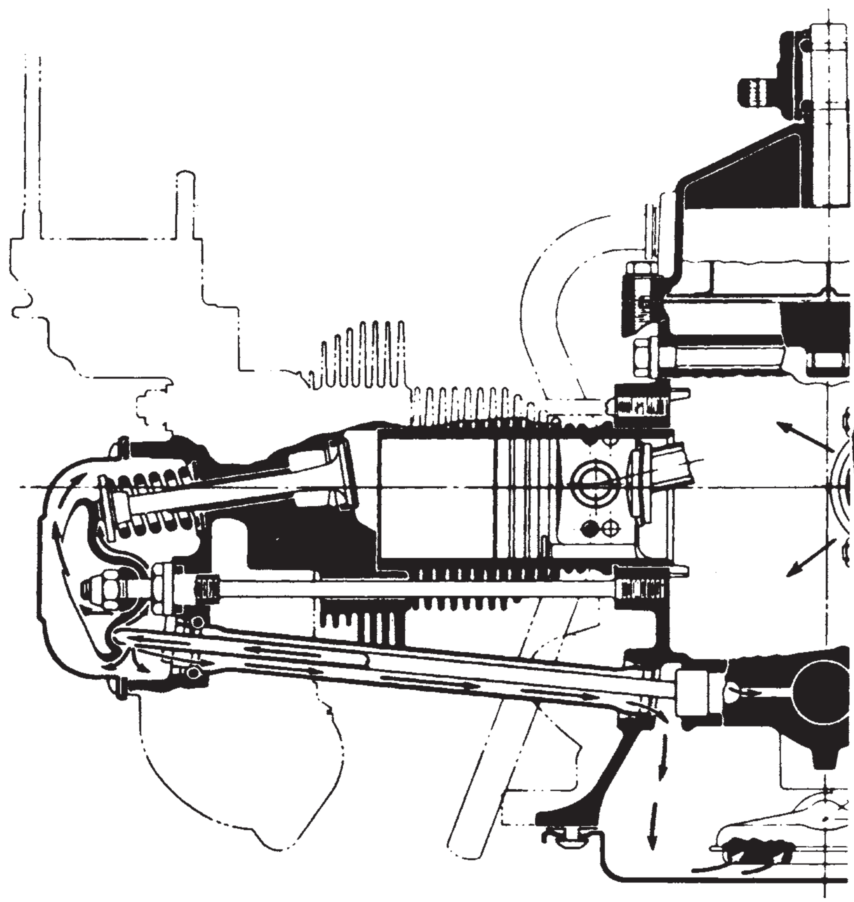
Lubrication, Cooling, and Breathing



Lubrication-system changes are essential for engine life when building a racing engine. This chapter tells why the changes are needed and how to make them.

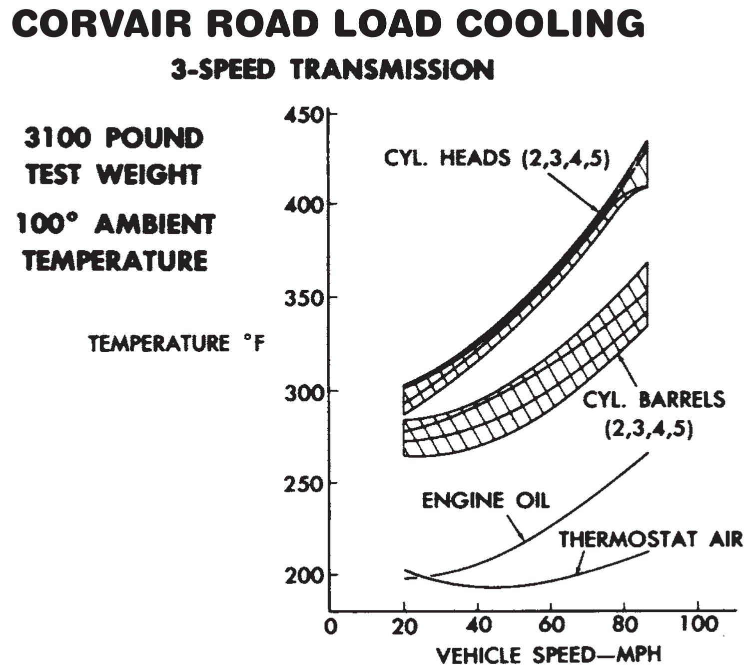
Everything you do to increase Corvair power increases the production of heat simultaneously. To maintain engine temperatures at usable levels requires increasing cooling abilities while accomplishing other modifications. Because oil is used as an essential element in eliminating heat from the Corvair engine, lubrication has been discussed in this chapter as inseparable from air and oil cooling.

You cannot, except at great expense, increase the cooling-fin surface of the cylinders or heads. General Motors carefully engineered these items to provide maximum heat removal from the available cooling air consistent with the limitations of modern volume-production techniques.

You can greatly improve cooling by changing to a folded aluminum fin cooler 1960 to 1962 Corvair part, as long as you are a regular at keeping the area clean. The 12-plate cooler introduced on the last Spyder and carried on for all high-performance use, probably cools as well as the earlier, smaller folded-fin cooler, but is much less likely to get plugged up with debris. Some additional help can be supplied by improving the heat-radiating characteristics of the engine's cast-iron and aluminum surfaces, both finned and otherwise. A little improvement is possible through exchanging certain of the sheet metal parts for finned-aluminum components. Added cooling is also available through better use of the oil's heat-removal characteristics via increased flow made possible through bearing and oil-pump modifications. Adequate crankcase breathing is also important to keep engine temperatures at reasonable levels. All of the foregoing modifications are fully described in this chapter.

Chevrolet improved fan-belt life by changing to a magnesium blower fan (1964), but the lesser inertia of this new component didn't help belt-loss problems very much. The added belt guides did help. Information is provided on installing the magnesium blower and perhaps more importantly, minor idler-pulley improvements to ensure belt retention. Details of the pros and cons of changing blower speed through use of special pulleys are additional features of this chapter.

No matter what you do to help the fan belt installation and cooling performance, you need to pay attention to the belt. No matter how much care you take in pulley alignment, belt lubrication and maintenance, you will eventually throw a belt. The first indication you will see is the temp-press light coming on as the alternator is no longer charging. If you are "enthusiastically" driving the car, you will probably feel the few extra horsepower that you have at your foot's disposal, since you are not spinning the fan. There is a new indicator kit available that will tell you almost immediately if the belt comes off and cooling air pressure has dropped off above the motor. Levair Performance is selling a kit that reads the pressure in the upper shroud and turns on a warning light if the pressure drops below a safe threshold. If the belt comes off at an inopportune time, you might only have a minute until the high head temps convince the valve seats to leave.



Stock Cooling System

Although it might appear that the Corvair is the same yesterday, today, and tomorrow, nothing could be farther from the truth regarding its cooling system. Detailed changes that have been made deserve your careful consideration and understanding.

The Corvair uses forced-air cooling. Engine enclosure by sheet metal shrouding directs air over the cylinder heads, cylinders, and oil cooler. Thermostatic cooling control is provided on 1961 and later engines by bellows-controlled damper doors at each side of the engine. These doors open when temperature of the air under the cylinders attains 205° F. Thus, even on cold days, the engine is operated as if it were in an ambient temperature of approximately 80° F. An engine blower fan is mounted horizontally atop the engine. It is belt driven at 1.58 times engine speed. 1960 models differ in that cooling air is controlled by a thermostatically controlled ring on the blower-fan inlet.

How Hot Is the Engine Getting?

The factory keeps you in the dark on this question, at least when you are driving the car. Nothing warns you of an overheat condition except an instrument-panel light which illuminates in the event of low oil pressure or an overheat condition sensed at one cylinder head. Oil temperature is neither measured nor indicated. Although cylinder-head overheat is indicated immediately by the light, oil pressure indication is far too slow. By the time the light comes on the damage has probably already occurred. For this reason an oil-pressure gauge should be considered even more important than the cylinder-head and oil-temperature gauges or warnings which are detailed herein. It should be mentioned that the Spyder head temperature circuit includes a buzzer to "sound off" and provide an insistent indication that it is time to "back off." This feature was carried on for the Corsa model, when turbo equipped. On non-turbos, the wiring is still there, they just left the buzzer out. The Temp-Press indicator lights up simultaneously on the dash.

The importance of knowing more about temperatures in a modified engine is stressed by the following curves and description for the original SAE Paper 140C, "The Chevrolet Corvair."

"An air-cooled engine is operated over a considerable temperature range under normal operation. From 20 miles an hour at road-load conditions to maximum speed, the cylinder-head temperature increases from about 300 to 435 degrees. This represents the worst road-load cooling condition: the same temperature also prevails at lower speeds during full-throttle operation. The temperature characteristic curve of this engine follows quite closely after the indicated mean effective pressure curve. The peak for our engine, occurring at about 2,600 RPM represents the worst cooling conditions we can obtain—about 30 degrees hotter than at maximum speed."

The foregoing statements related to the 80 HP engine as originally introduced and failed to mention that oil temperature simultaneously soared to 280° F, which is higher than can be considered safe. According to Mackerle, oil temperatures should be maintained above 176° F to keep down friction loss and dilution by gasoline, and should not exceed 230° F for continuous operation. Up to 230° F may be considered permissible for short bursts.

Measuring Cylinder Head Temperatures

All Spyders and the 1965–66 Corsa models have cylinder head temperature gauges operating from one cylinder head. Like many low-production parts, these devices are quite high priced should you choose to build your own from the stock parts, if they are available. You could install just the one gauge, but it would require a separate housing, and the marked lens must be mounted in the housing that you fabricate. The harder part relates to removal of your standard cylinder heads and machining an opening for the sender—that must match the one used in the Turbo 140 head, so you'll need one of those for a sample. Several sources sell an adapter which lets you install the fine-threaded sender in place of the original coarse-threaded unit. Perhaps a simpler method would be to change to an aftermarket Cylinder Head Temp (CHT) gauge. They used to be commonly available from most gauge manufacturers, but since Porsche left the "air-cooled" scene, many of them have been dropped. VDO still sells an appropriate gauge. Westach Instruments in Petaluma, California, makes both a single and a dual CHT gauge. Autometer still sells one, as long as your CHT will never exceed 340° F. The GM gauge was a "thermistor" based gauge, where the sending unit changed its resistance to ground as the temperature rose. All of the aftermarket gauges are "thermocouple" based, where a pair of wires of different metallurgy, crimped together,

Westberg Manufacturing makes Westach gauges, including this dual cylinder head temp unit.

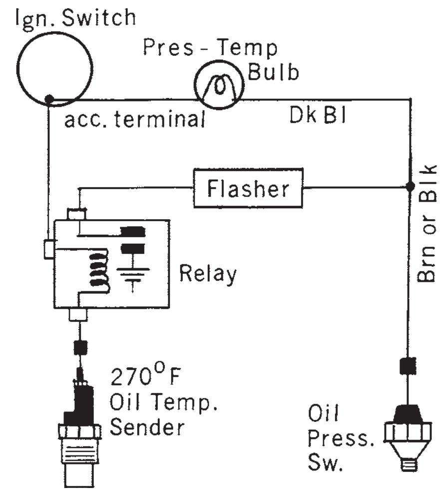
This single head temp gauge makes a great replacement for the factory unit on the Spyder and Corsa.

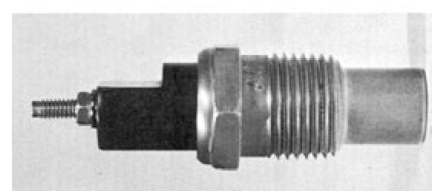
will actually send a small current down the wire pair, when the junction is subjected to the change in heat. The gauge on the dash is calibrated to show that small current as a temperature reading. The aftermarket gauges come with a method of installing the thermocouple into or onto the head. Many of them use a ring under the sparkplug to carry the thermocouple. The most accurate ones use a thermocouple probe which can be placed in the original thermistor locations, up inside the cylinder head. Be sure that the gauge will display a range of temperatures up to 600° F.

A Chevy dealer bulletin advised Spyder cylinder-head temperatures as: 200° to 300° at idle; 350° to 475° at 30 to 60 MPH cruise; and 460° to 575° from 3,000 to 5,000 RPM at full throttle. Overheat-warning switches are used on all Corvair engines, and these have changed as the factory has upped the horsepower produced by the engine. The unit used on the Spyder and 140 HP engines operates at 575° F, but uses a 3/8 inch-24 thread instead of the 3/8 inch-16 thread used on the other switches. '60–'64 engines, if not originally supplied with air conditioning, can have a switch that operates somewhere close to this 575° F temperature by installing Part No. 1993574 (identified by grooves on the hex nut).

Oil Temperature Measurement

Oil temperature can be measured with a sending unit coupled to a gauge. Although all special oil pans include a boss for the addition of such a sender, the bottom of the oil sump gives a false (too-cool or too-hot) reading that cannot be relied on for accuracy. The best place to measure oil temperature in the Corvair—as the oil leaves the cooler—is not easy to get to because the rear accessory cover delivers the cooled oil directly to the main oil passages. A second-best choice for early engines is to insert the temperature sender in the right side of the block where the pressure sender was originally located. If this spot is used, an aluminum heat shield must be constructed for the sender. Later blocks have a boss near the cooler. This boss can be drilled and tapped for sender installation.





Ford oil-temperature switch closes at 280° F, flashing panel light in warning when wired as shown.

If you merely want to be warned when oil temperature reaches the danger point, some small amount of money will buy the system Ford uses with their 427s. The schematic diagram shows how to wire the parts to work with your TEMP-PRESS warning light. When oil temperature rises above 270°+/– 48° F, the instrument-panel warning light flashes on and off until temperature drops below that point. The low-pressure warning (2 to 6 psi) operates as it was intended to. Ford parts required are: oil temperature relay

Autometer makes several different series of instruments, many of them resemble the original GM-style gauges.

ClTFlOB840-A, oil-temperature flasher C3AZ9E296-A, and oil-temperature sending unit C3AZlOB921-A. The sender will require some special mounting techniques.

Pressure Switch

When your Corvair engine's oil pressure drops to 2 to 6 psi, the oil-pressure warning light tells you that you have insufficient oil pressure. Racers sometimes call the original switch, the "Engine Destruct Indicator," because it comes on at such a low pressure, telling you why the motor just broke—you did not have enough oil pressure. This inadequate warning system is the primary reason for installing an oil-pressure gauge. 1960–62 pressure switches failed and leaked frequently due to design and location in an area of extreme heat in the air-exhaust duct. The switch was improved and relocated. Modify your '60–'61 model to relocate the new switch into the top of the oil-filter adapter. Use a six-point 1-1⁄16 socket, not pliers or a 12-point socket or you will distort the switch, causing quick failure.

Oil Pressure Gauge Choices–Electric versus Mechanical

Installation of an electrical-type gauge is comparatively easy, as it is only necessary to mount the stock oil-pressure switch with the pressure sender onto a tee. It is important to keep the oil pressure switch and warning light in the system. You might just be looking the other way when the oil filter bolt falls out. The light will draw your attention. It is safer, and therefore more desirable, to measure the pressure at a point more remote from the pump output, such as at the main oil gallery. The tapped hole on the right side of the block where the oil-level gauge tube enters the block connects directly into one main oil gallery. Measuring pressure nearer the pump outlet may not disclose a blocked oil gallery, but that is pretty rare. Should you choose to use the remote location for the pressure-measuring point, then the sender should not be mounted directly onto the block below the cylinders.

The first Corvairs ('60 and '61) suffered from pressure switch failure due to high ambient temperatures and this location was abandoned in favor of placing the switch by the generator. A 45-degree elbow can be screwed into the boss and a copper tube used to carry the oil to the pressure switch that can be bracket supported just atop the center of cylinders 1 and 3. Take care not to obstruct the airflow, of course. Mechanical pressure gauges, even with the long pressure tubes needed when locating the actual gauge at the dash, used to be preferred to the mechanical gauges, because the electrical ones were limited to a 90-degree movement. The mechanical pointer could sweep about 270 degrees, giving finer definition of the temps. Newer electric gauges, now with internal stepper motors, can sweep the larger area.

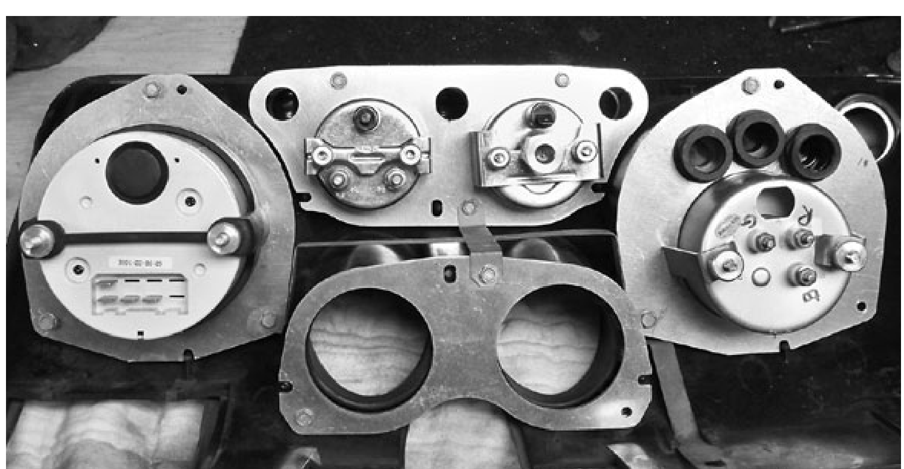
Gauge Installations

If you are preparing an early model that didn't start out as a Spyder, you can switch to the Spyder dash and the instrument feeds to provide the data. That will present you with a few extra gauges. But you will still be missing an oil pressure and oil temp gauge. A small panel underneath the radio will provide you with room for three extra gauges. I suggest an oil pressure, an oil temp, and a voltmeter. Late models can add gauges in the dash above the radio, even angling them toward the driver. But if you start with the Corsa dash, you can add several gauges in the dash itself, without sawing new holes or adding mounting plates underneath, maintaining that "stock" look. If you are not running a turbo, you can dump the vacuum gauge along with the small clock that hasn't worked since the Carter administration. You can replace the lame Corsa tachometer and even install a GPS enabled speedometer if you wish. Now on the market is a set of four mounting plates that attach to the back side of the Corsa dash, using the original mounting holes. The plates retain the standard aftermarket gauges of your choice, four in the middle, 2-1⁄16" gauges, and two on the side, 3-3⁄8" gauges. The late Corvair used the standard 0-90 ohm fuel level sender and all the gauge manufacturers make compatible gauges. The plates are removable and the installation can be returned to stock if you change your mind. See the pictures and start picking out your gauges. You need not replace the Corsa speedometer, if it is working okay, unless you spend a lot of time over 140 MPH.

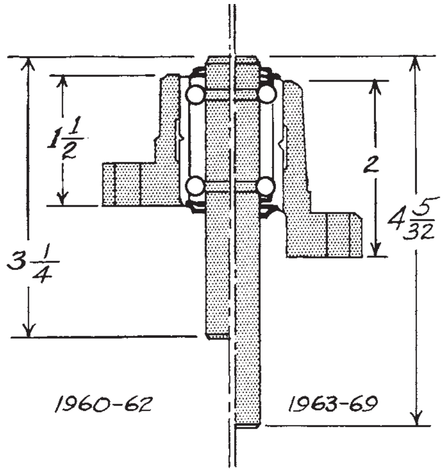
Corvair Engine Blowers (Fans)

Four types of Corvair fans have been used during 1960–64. All are described here and three are pictured.

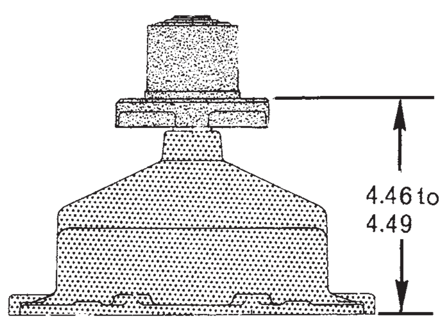
1960–mid-1961—11-inch diameter steel fan with 24 vanes on an outer ring. 1,800 CFM at 4,000 engine RPM.



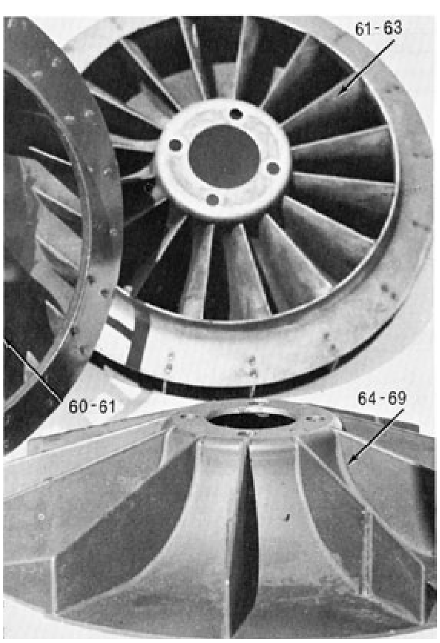
This view of the back side of a Corsa dash shows how individual gauges can be replaced with aftermarket gauges, including those important oil pressure and temperature gauges. Everything screws onto the original mounting points and is totally reversible.



Blower-hub comparison. Later models place load near center of double-row bearing for increased life.



Installation drawing shows height required for installing late hub and shaft assembly into the crankcase cover.



Poor air-delivery characteristics at high RPM. Ring on inlet probably reduced theoretical output.

1961–1963—Production-line "running change" made in mid-1961 to a 10.7-inch diameter steel fan with 16 vanes extending to the center of the blower hub. 1,460 CFM at 4,000 engine RPM.

1962 Plastic Fan—1962 engines were supposed to be equipped with a plastic fan (nylon) and GM literature indicated this fact. Few, if any, got into the hands of private owners as these were withdrawn from production and replaced by dealers at factory request.

1964–1969—11.2 inch diameter magnesium blower fan. Design almost identical to plastic fan that was abandoned. Same air delivery as 1961–63 models, but weighs ⅓ as much. Provides greatly improved belt following at high RPM. Belt is less subject to stretch or slip on acceleration and deceleration because there is less fan mass. Installation of this blower requires minor blower bearing and hub changes for best bearing life. The '64 unit can be installed directly onto the 1960–63 hubs without change if desired.

NOTE: *CFM = Cubic Feet per Minute*

How To Install the 1964 Blower (Magnesium) on Earlier Models

Remove the main shroud and the old blower. Install the 1964 blower fan directly onto the hub. The magnesium fan, Part No. 3828742 sold for $6.40 new, and are commonly found at swap meets. The '65 and later fan used different bolts and isn't a direct bolt-on for the '60–'64. If the engine is to be used in an all-out-racing situation, 1/2 inch can be turned off the major diameter of the magnesium blower, according to an article in Corvair Communiqués, Vol. 2, No. 3.

While you have the shroud and old blower off, you should first check the bearing condition prior to installing the new fan. If the bearing is noisy or gritty feeling, it should be replaced. An improved bearing and hub assembly

Another American Pi production. The fan bearing assembly comes apart to replace the bearings.

As assembled. The special tool holds the fan bearing in place as you remove the top retainer.

was introduced on 1963 models on engines beginning with TO 913. This design placed the blower-pulley centerline ⅝-inch closer to the bearing centerline, thereby improving life through a better load distribution. Parts required are an Engine Blower Pulley Hub, 3826474 and a Blower Bearing & Shaft Assembly, 907448. Note that both hub and bearing are designed as a pair and must be installed together. Remove the crankcase cover. Support crankcase cover and press blower shaft out. Remove blower bearing and shaft assembly from hub by pressing on bearing outer race with a ⅞-inch socket (deep type). Install new bearing and shaft to hub.

WARNING: *Press only on bearing outer race when removing or installing bearing and shaft assembly to blower hub. Do not press on inner race or shield.*

Coat shaft with hypoid lubricant or Lubriplate. While supporting crankcase cover, press on shaft to install hub/ bearing assembly to height shown in drawing.

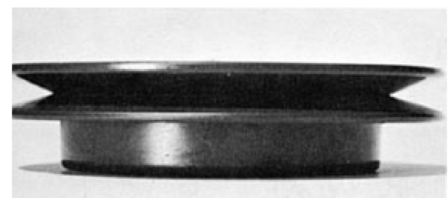
Before replacing the crankcase cover you will want to read the section on crankcase breathing to see what further changes or additions may be needed prior to reassembly. Also read details on special pulleys.

Fan Belt

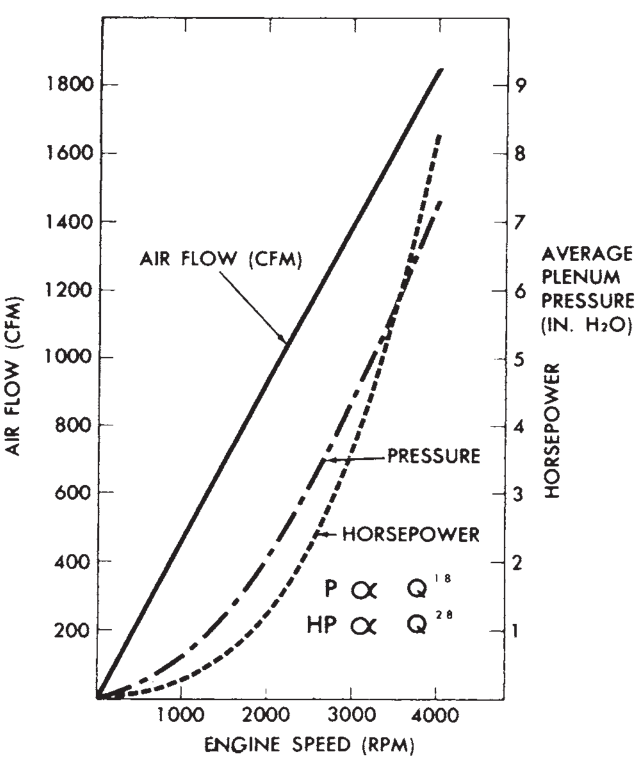
The best data on fan belts was published in Chevrolet Service News in the January 1962 issue. "Since the introduction of the Corvair vehicle line, exhaustive laboratory and field testing has been conducted to develop a Corvair engine blower belt that will provide maximum durability. As a result of this constant testing and improvement, it is felt that the currently used blower belt #3780981 will provide very satisfactory service . . . the only fan belt now known which will meet Chevrolet engineering specifications. Corvair owners should be told that if in an emergency, it is necessary to install a different belt, it would be advisable to replace that belt with #3780981, as soon as convenient." Of course, Chevy hasn't supplied that belt in a long time. Otto parts supplied a fine belt, the Otto Parts "Super Belt."

FAN POWER TABLE

RPM	*Stock Pulley*	*Adjustable Eelco Pulley*			
	1.58:1 ratio	*1.4*	*1.32*	*1.25*	*1.20*
2,000	1.0	0.9	0.8	0.6	0.5
3,000	3.5	2.6	2.5	2.0	1.9
4,000	8.0	7.0	5.2	4.0	3.7
5,000	15.6	10.6	8.3	8.0	7.5
6,000	27.0	18.5	16.5	13.4	11.8
	Numbers in these 5 columns are HP required by fan at RPM shown				

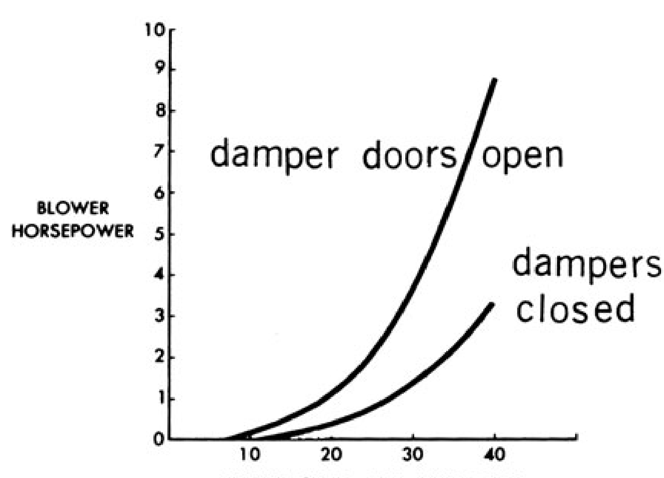


Eelco's adjustable pulley, now available from Clark's, provides four fan ratios to increase HP. Installation also requires use of a longer belt.



BLOWER POWER REQUIREMENTS

Drawings adapted from SAE 140c.



That belt is still supplied by Clark's Corvair. Clark's also offers their own HD belts. I have found the narrow belts that ride farther down in the pulleys have better life. The Gates 3VX560 belt has also worked well. If you ask 10 Corvair racers, you will get 10 answers, maybe 12.

"Most owners carry a spare belt for emergencies. If a belt flips over, replace it. Some of its strands probably parted when it assumed the reverse position." If you are going to store a belt for emergencies, don't coil it up too tight, as it will have to be stretched to operate.

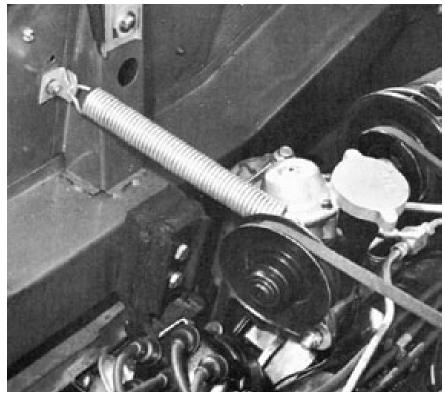
Keeping the Fan Belt Intact

In mid-1964, Chevy introduced simple belt guides to restrain the belt from flipping over or leaving the pulleys at high RPM. These guides have proved especially helpful, both for normal and competition driving. However, they do have sharp spots on them as they come from the Chevrolet store, and it is a good idea to round off all of the sharp edges. The rear guide installs easily on the idler pulley mounting studs, but the front guide requires a homemade wedge-shaped shim to make the installation on shrouds supplied prior to the introduction of the guides. It is easiest today, to just swap out the top shroud.

Don Eichstadt points out that fan-belt throwing can be caused by crank pulley or balancer run out. He suggests six radial paint marks around the balancer rim so that creeping of the outer rim can be noticed easily, no matter what position the balancer is in when the engine is stopped.

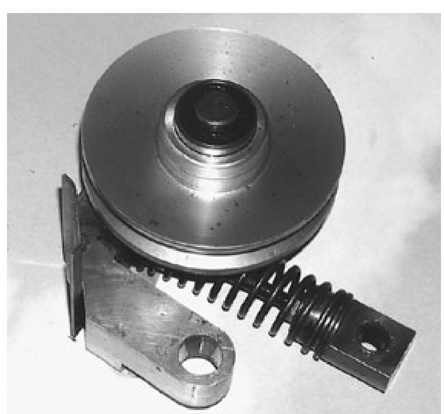
Fan-belt life can sometimes be improved with a spring-loaded idler assembly, but this is not a cure-all. Careful attention to the alignment of all pulleys and the use of stock belt guides will usually keep the belt intact and on the job. The spring-loaded kits were made by EMPI, OTTO Parts, Bill Thomas, and Corvair Underground.

Installation of the spring-loaded idler is extremely simple, especially with some of the kits that are available. A bracket is screwed to the sheet metal at the rear of the engine compartment. The idler is removed and a hole drilled for spring attachment. The Otto parts kit used a twisted metal rod for attachment. A ½-inch drill is used to enlarge the existing hole in the idler bracket. An oversize bolt is used as a pivot point. The forward stud is equipped with a large flat washer adjusted with a lock nut. Both sides of the idler are coated with high-temperature Lubriplate to allow the idler to pivot freely in the fore and aft directions. Details for installation are included in the kits.



Spring-loaded idler is easily installed, acts as a shock absorber to keep belt on pulleys and to increase belt life. 1964–65 magnesium fan recommended. Otto Parts idler illustrated.

Spring idler kit as received.



Corvair Underground fan belt idler kit with pulley installed.

This aluminum fan drive pulley from American PI replaces the stock, stamped-steel unit.

This aluminum idler pulley uses readily available bearings and is machined to a tight tolerance.

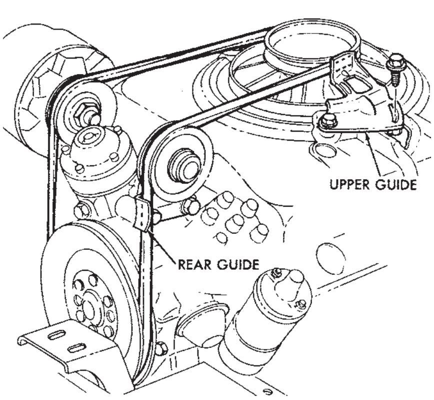
The Corvair alternator rotates the opposite direction from the V8 units. This Corvair-specific fan unit will pump more air than the stock unit and look great as well.

This is the fully assembled unit.

After installing the belt on the crank, fan, and idler pulleys, the spring is attached. Then, while holding the idler in the forward position, the belt is slipped onto the generator pulley.

Incidentally, the most-important alignment is that of the generator pulley, which must be positioned about ¼-inch rearward of what would appear to be an optimum straight line connecting with the crankshaft pulley. GM tests showed that this eased the belt onto the larger crankshaft pulley and prevented the tensioned belt from flipping over. The same tests showed that alignment of the belt leaving the crank pulley had the least effect on belt life.

The newest kit on the market is the one from Corvair Underground. The spring-loaded portion of the idler is built into the pulley. No need to attach a spring to the rear body work. The unit has an adjustable spring assembly so you can adjust the amount of tension applied to the belt. This has a lock nut which must be tightened up before running the unit. The mounting on the engine is about the same as the older kits. The trick is providing a restrained mount that allows easy travel fore and aft for belt tension, but almost no side to side movement which would affect the fan drive pulley and the dampener groove alignment. Finally, for the racers, a new complete kit is on the market, the half-speed fan kit from LeVair Performance Products. This kit has you replace a number of different parts on the motor. The fan drive pulley on top is larger, the vibration dampener is replaced by a modified dampener inner pulley, with the outer ring removed and a smaller-than-stock driving pulley installed, and finally, the upper oil-filter/generator adapter is modified for special alignment. With the smaller driving pulley and the larger driven pulley, the actual speed of the fan is much slower than stock at any given engine RPM. But with those two modified pulleys, the plane that the alternator rotates in has changed and the plane that the spring loaded idler pulley rotates in also has to change. The upper adapter housing determines those planes because both items attach to the sides of the adapter. The LeVair modified adapter has both sides remachined to better align the pulleys with the relocated drive and driven pulleys. It is slick and it works. It also uses the regular Corvair fan belt. It is for racing/autocross use only, however, because even with the full size stock fan, not enough air is moved at slow speeds to adequately cool the motor. It is fine at high RPM, but not for street use. I use this kit with the Corvair Underground pulley on my autocross/track car.

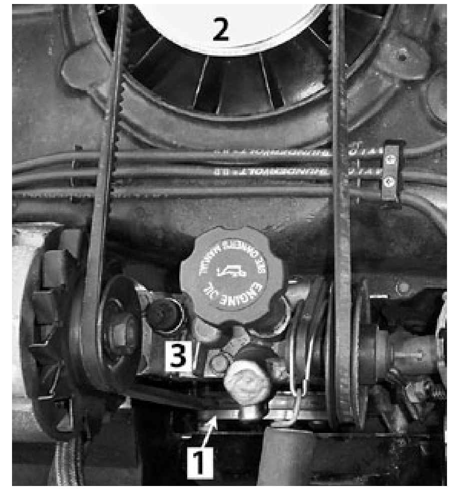


Installation of 1964-65 belt retainers requires using 1⁄16-inch shim between belt and retainer by idler, then tensioning belt and tightening idler. Shim is next used to set clearance by fan pulley. Illustration from 1965 Corvair Shop Manual.

Why Special Fan Pulleys?

Adequate cooling for the worst load and ambient-temperature conditions, including full-throttle operation in summer temperatures is provided by the stock system. Turning at 1.58 times engine speed, the fan produces 1,460 CFM at 4,000 RPM (engine speed). This air quantity is just sufficient for continuous full-throttle operation and is absolutely necessary for hard driving in hot climates or for road racing.

Horsepower is needed to drive the Corvair fan and the same is true for a water-cooled engine's fan and water pump. But, the water-cooled job has the additional task of pushing air through the radiator. This means no streamlined airflow and increased wind resistance. Thus, when all factors are considered, the air-cooled engine probably requires less HP for cooling especially at part-throttle cruising. Look at the graphs and notice that only 3.5 to 5.5 HP is required at 60 to 70 MPH in high gear. Fan-power requirement increases as the cube of speed and is dramatically detailed for stock and special-ratio pulleys in the Fan Power Table, page 88.



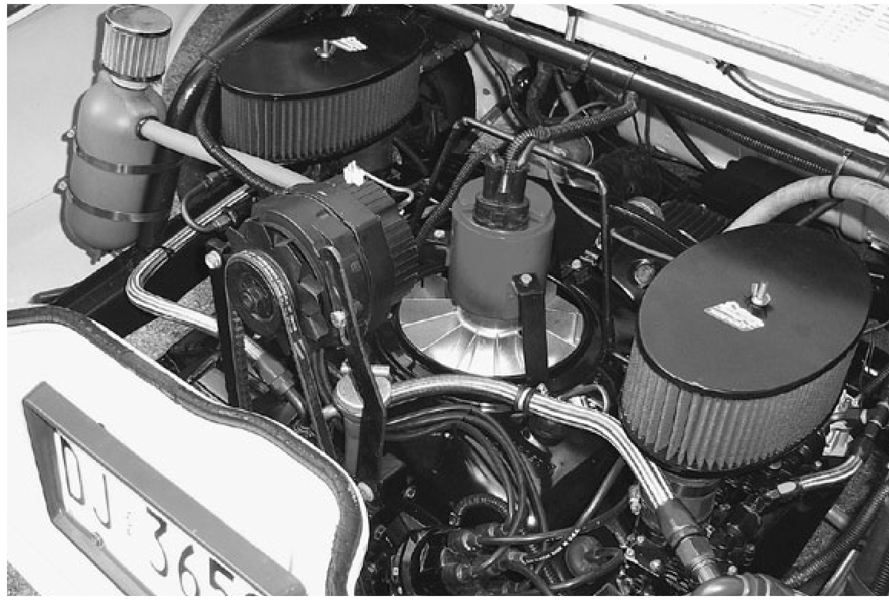
1) Smaller drive pulley replaces harmonic dampener. 2) Larger driven pulley results in slower fan rotation. 3) Alternator adapter is modified to align the belt guides to the altered pulleys. (Oil filter was moved to the front of the car.)

For street or highway operation where ambient temperatures are not extreme, reducing fan speed adds horsepower that you can feel! When a special pulley is installed you must become alert to the overheat indicator because less cooling is available at a given speed. And, you may want to install oil-temperature warning devices as described elsewhere in this chapter.

To install just a special pulley requires using a longer belt and realigning generator and idler pulleys. Because the longer belt runs at the same speed (crankshaft-pulley diameter has not been altered), belt wear stays the same. But, because the longer belts are not specifically engineered for the Corvair's tortuously twisted layout, life may not be equal to the stock component. In any event, the use of a spring-loaded idler is recommended for best belt life.

One of the slickest Corvair accessories was Eelco's adjustable fan pulley, also sold by Otto Parts, still available at Clark's. The pulley is made in two pieces that are held together by four bolts that also attach the device to the blower hub. Construction is such that the parts can be rotated in relation to each other, then bolted solid, to obtain four separate ratios as shown in the preceding table. The 1.2:1 groove is at stock groove height, but the lower ratios (smaller diameters) move the groove upward. This places the 1.4 ratio ¼-inch too high for perfect alignment. To make best use of these lower ratios the blower-bearing shaft can be pressed farther into the crankcase cover to place the groove at stock height. I recommend that 1.32:1 be the slowest ratio used so as to maintain adequate groove depth.

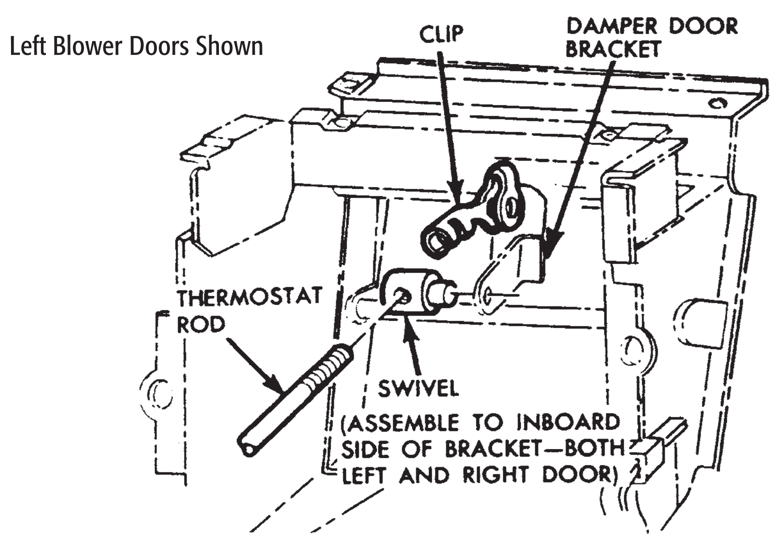
If a single-ratio pulley is used, the blower-bearing shaft can be shifted to keep the groove at stock height.


Brian O'Neill's track car uses an electric motor drive for a full-size fan. Proven in cool weather, it has yet to be tested in hot conditions.

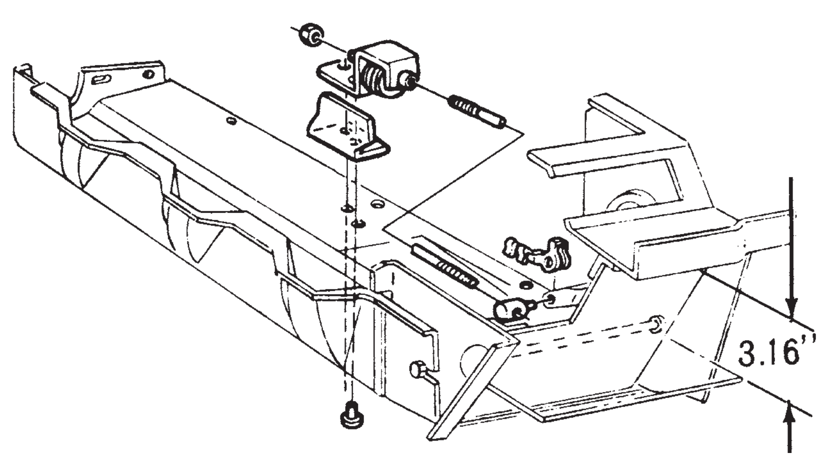
Damper Doors

One of the bits of misinformation that prompted this book was the widely believed fiction that the Corvair's thermostatically controlled cooling system should be disabled. One performance manual went so far as to recommend that the damper doors should be propped open permanently or the inlet-damper ring eliminated on the 1960 models. This same writer further stated that "no damage could result and this would reduce the amount of horsepower required by the blower fan." Thus, many Corvair owners have obtained two misconceptions.

Let us examine these "recommendations" in detail. First, blocking the dampers open increases fan-horsepower requirements. When an increased volume of air is moved, as when the dampers fully open for maximum cooling, it takes more power to push the air through the cylinders and the oil cooler. Fan HP requirements are reduced by closing the dampers and the recirculation ducts. For drag racing you can block the dampers closed for the race, then open them immediately afterward. If a working generator is not required by the rules, then remove the belt for the race and simplify the entire procedure. This assumes that you have installed the spring-loaded idler to make this a convenient procedure. Secondly, blocking the dampers open increases engine wear by lengthening the warm-up time. Open dampers eliminate one of Corvair's most



Early model shroud and thermostat assembly.



Late model drawing shows that lower shroud and thermostats were revised in '65, placing the thermostat just behind the center cylinders and shortening the operating rod.

desirable features—quick warm-ups. A quickly warmed up engine suffers less wear, especially when it is allowed to reach and maintain its normal operating temperature for a period of time prior to shutting it off.

Short hops during which an engine never warms up increase crankcase dilution by gasoline, build up varnish and sludge accumulations, and greatly increase cylinder wear. The high-wear rate is caused by combustion products that condense on the cylinder walls to cause etching and rapid wear. Cold cylinders also mean thick oil that increases the friction that pistons must overcome. The hotter the cylinder walls, the less friction loss, especially with high-viscosity oils. This is another good argument for the use of multiviscosity oils: to decrease friction during the critical warm-up period. If you are operating the Corvair engine in an extreme environment for extended period—over 100° F and high loads, you could remove the lower shrouds for those conditions. Put them back on when the temps drop back to normal.

You can check this oft-proved and well-documented series of facts in any internal combustion engine textbook.

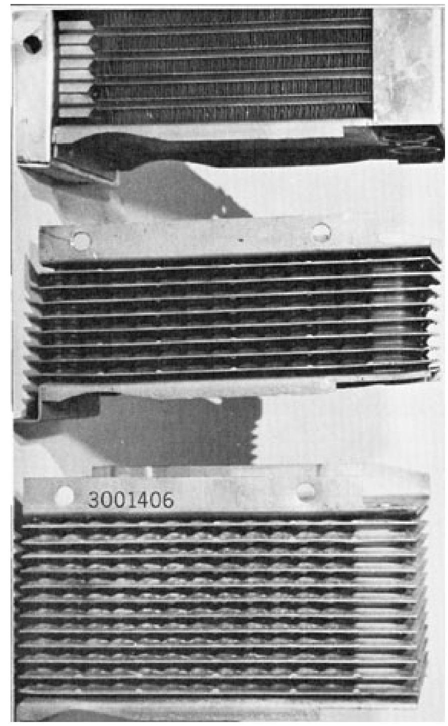
Corvair Damper Door Assembly

When adjusting thermostat linkage the following detail must be observed. The thermostat-rod swivel, at both the left and right damper door, must always be assembled to the inboard side of the door bracket. The swivel pin must always point outboard as it is inserted into the door bracket. Improper assembly will cause a bind at the thermostat stem, resulting in leakage and failure of the thermostat when the engine is operated. There are several tricks to connecting up the link to the doors. It is important that you do not let the doors snap closed during installation or removal of the shrouds. That hard snap closing will damage the thermostat in short order, and good ones are getting expensive. I assembled a special tool for connecting the thermostats. It can usually be used for removal as well. I use an old thermostat rod with a long fine thread nut installed and double-nutted into place, halfway onto the rod. I pull the door open and screw the other end of the double-long nut onto the tip of the installed rod. You can now pull gently on the rod to take the pressure off the thermostat and allow the door to move freely. A screwdriver tip can lift up the "pal" portion of the clip and you can just slide the swivel pin out and the clip off. It works for the installation as well.

Oil Coolers

Like the cooling fans, the oil coolers have also been subject to considerable change since the introduction of the Corvair engine in its original form. At least four coolers have been supplied during the 1960–67 period. The original folded-fin aluminum oil cooler as used on 1960–62 models is the best one you can get. It dissipated about 160 BTUs per minute, keeping lubricating oil temperature at 280° F with the engine under full-throttle operation in an ambient temperature of 100° F. In 1963, the production-economy types introduced a new design 3-plate cooler on standard and 102 HP engines, and an 8-plate job on the Spyders. Experience showed that more cooling was needed for the 164-inch engines introduced in '64, so those used the 8-plate design on standard and 110 HP engines, and a 12-plate on the Spyders. The '65 Corsa and 140 HP engines all use the 12-plate models, lower HP models got the 8-plate. When both are perfectly clean, the 12-plate type doesn't shed as much heat as the original folded fin cooler, according to all of the information that I have been able to glean from various sources.

If you are going to race your Corvair in hill climbs or road races, then improved cooling must be supplied by installing a large, remote-mounted cooler that is connected through ½-inch inside diameter (AN-8) or larger hoses. The hoses can be connected to the stock oil cooler adapter manifold after it has been modified by heliarcing female pipe fittings (aluminum) to it and opening up the holes. The reason for the large lines is that oil is quite viscous when cold and large lines ensure that the bearings will be adequately supplied under warm-up conditions. The pressure-relief valve



Three of the four oil coolers supplied for Corvairs from 1960-2 (top), 1963 Spyder and '64–'69 standard and high-performance (center), and (bottom) is the 12-plate cooler for '64 Spyders, '65 140–180 HP engines, and all air-conditioned engines.

Doug Roe's Spyder-engined "Desert Rat" never exceeded 260° F oil temperature in a one-hour race in 90° ambient temperature using Harrison "big car" oil cooler installed as you see it here. Body is cut away behind cooler for airflow. Hose is cool-air inlet for carburetor.

in the filter adapter must be removed and plugged. Otherwise, the restriction caused by the cooler and filter combination will cause the relief valve to open and the oil will bypass the cooler. Before modifying the oiling system in any way study page 6A-6 of the '61 Corvair Shop Manual where lubrication system functioning and routing is thoroughly explained and diagrammed.

The best externally mounted oil cooler is the stock car racer's model that Harrison Division of GM manufactured. Because that is no longer available, the aftermarket has stepped up with dozens of different coolers available in every size and shape. The mounting shown in Doug Roe's car is generally accepted as the best position as cool air can be ducted to the cooler, and it is close to the engine so that the lines can be kept short. Most race organizations now allow the cooler to be mounted up front, usually behind the license plate area, the final Stinger location. If you are ducting air to the oil cooler, it pays dividends to duct air away on the outlet side.

Oil Filters

The stock Corvair oil filter is adequate for most road use, but when the engine is being modified for competition, use a larger filter. It will give added oil capacity as well as improved filtering. A non-stock filter will also be easier to mount remotely on Porsche/VW installations where the stock filter has to be cut off to get the engine into the chassis. Perhaps the easiest full-flow filters to adapt are those made by Ford. The racing aftermarket has embraced this design and produced many adapters to allow remote mounting of single or dual filters. The Ford filter, and the aftermarket equal, contains a bypass valve inside each filter, unlike the Chevy V8 filters which have the bypass mounted in the block. The remote adapters start at about $15. Trans-Dapt P/N 1028. Any of the better Ford replacement filters will work. I recommend the K&N spin-on HP-3001. It is a Ford replacement and is a very well-made part. There are also smaller filters that fit, if you have a space problem.

Hoses to and from the oil filter must be ½-inch diameter minimum, I use AN-10 hose. These inside diameters are absolutely essential to avoid oil starvation when the oil is cold and viscous. Attaching the hoses at the engine end is another problem, especially with the die cast oil filter adapters used after 1961. Adding threaded holes to attach ½-inch I.D. hoses will probably require heliarcing onto one of the 1960–61 permanent-molded adapters as these have more "meat" and are more easily modified. Do not hesitate to reroute the passages in the adapter to permit getting the hoses in the correct position. You may want to bring the new hoses in under the generator, or into the top of the adapter, depending on the rest of the installation problems. Avoid interference with the fan belt and generator. Arrange the hoses so that they do not have to be removed to install a new fan belt.

Oil Pans: Stock or Special?

Finned sump covers should only be discussed after understanding the engineering facts of the matter. Fortunately, several authorities on engine construction have written a considerable amount of material that we can study to improve our knowledge. Besides his motorcycle design experience (Vincent motorcycles) Mr. Irving was the designer behind the F1 Champion Repco Brabham V8 engine.

P. E. Irving, in his excellent book *Motorcycle Engineering* has this to say, (p. 239):

"While oil is good at collecting heat, it is very bad at getting rid of it again, because the layer directly in contact with a cool surface increases in viscosity and simply stays there, acting as an insulator and effectively preventing heat being dissipated from the hotter oil in the interior. Ribbing a sump which contains a quantity of oil is not very effective unless there are some internal ribs also to transfer as much heat as possible from the body of the oil, but ribs placed on areas against which hot oil is violently thrown by centrifugal action can be made to radiate a lot of heat. In this connection, the polishing of crankcases, though pleasing to the eye, may cost almost as much as the whole of the machining and cuts down the heat-radiating ability to a fraction of what it would be if the metal were left "as cast."

In another part of the same book (p. 183) Mr. Irving says,

". . . a polished surface emits less heat by radiation than a black one. The rate of emission from a polished surface is approximately one-tenth that from the same surface covered with a thin film of lamp-black, and the emissivity of a cast-aluminum surface is increased about 10 per cent by a *thin* coating of black paint."

Note that a black surface is ten times as efficient as a polished one. The Alcoa Engineering Handbook indicates that Irving's comment may be quite conservative. Alcoa compares an as-cast surface with one which has been black-anodized to a depth of 1.7 thousandths. The black surface is more than ten times better in heat-radiating ability than a plain cast surface. Remember these facts when you are tempted to start polishing and chroming various engine parts that could conceivably contribute to cooling efficiency.

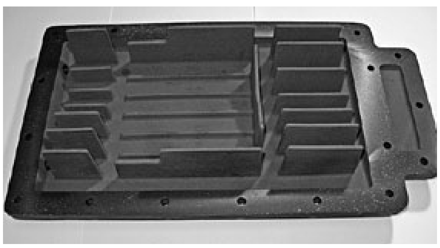
Another noted mechanical engineer, Mr. Julius Mackerle in his book *Air-Cooled Motor Engines* states that it is an error to assume that using a greater quantity of oil will reduce oil temperature. He further remarks that, "A finned sump does not aid cooling to any great extent as the oil does not flow down the cooled sump walls. Cooling is more intense on the crankcase walls, over which the oil flows in a thin film…Best oil cooling is obtained by a tube-type radiator . . . "

The reader should take note of the words "thin film" as these are the key to understanding the removal of heat from oil. If you choose to use the stock Corvair oil pan, do not chrome plate it! Additional heat-removal capability can be added by welding or brazing sheet metal fingers and/or baffles to extend into the hot oil to transmit the heat to the radiating surface. The pan is black as received from the factory. If you have to refinish it, use a thin coat of flat-black paint. The stock pan has approximately 178 square inches of radiating surface.

Should you decide on one of the more exotic special pans made of cast aluminum you will find that there are several to choose from. Most of them offer similar features including:

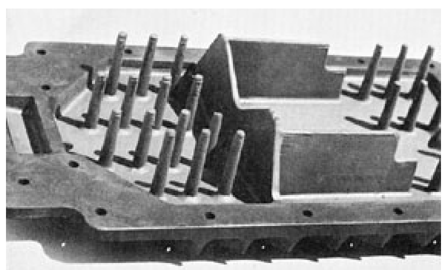
1. Baffles, which slow oil in sloshing away from the pump pickup in corners or on hard acceleration and deceleration. These baffles serve an important

The newest Clark's pan is finned on the bottom side to maximize temperature shedding.

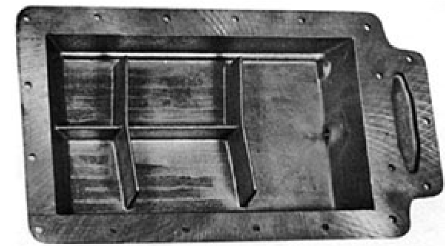


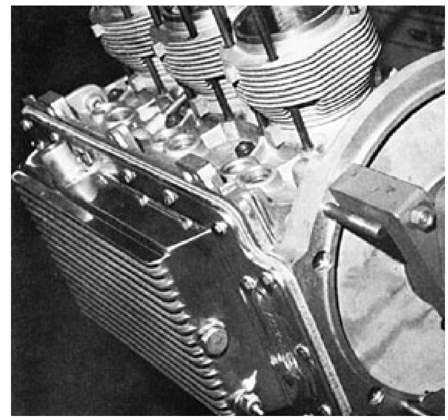
Inside the pan, these fins gather heat from the oil, by maximizing contact area.

Otto Parts finned oil pan and rocker covers are black anodized to improve cooling efficiency. Pan has 314 square inches of cooling surface area; covers add another 316 square inches.



Interior construction of Otto parts pan includes 24 posts which extend into hottest portion of oil to transmit heat to cooled surface. Baffle construction allows stock pickup location at coolest part of sump. Pan adds one pint to oil capacity.





Cragar oil pans provide additional oil capacity; may give ground-clearance problems. Baffles must be cut away to relocate the oil pickup on the bottom. Polished surface should be eliminated and pan black anodized for maximum cooling effect.

function in conducting heat to the radiating surface of the pan, providing the pan is not polished. Some pans have no baffles, or very short baffles that should be lengthened to at least provide one central baffle equivalent to that provided by the stock pan. In some instances it will be necessary to mill away a portion of the short baffles. This will permit locating the pump pickup on the bottom of the pan to take advantage of the extra oil capacity. The cool oil lies closest to the radiating surface.

2. An undrilled boss for the addition of an oil-temperature sender.

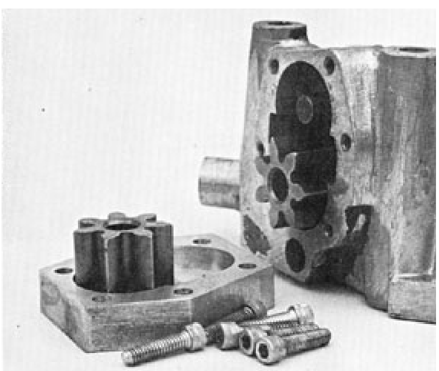
3. Quieting—because the external fins and/or internal baffles make the pan a ribbed structure, it will not resonate as much as the unbraced stock item. Thus, your engine will be somewhat quieter.

4. Additional oil capacity up to three quarts more than stock. This is a mixed blessing on any engine other than one for all-out road racing purposes. Additional oil capacity, as already mentioned, does not lower oil temperature—it just increases the time required for the oil to attain a stable operating temperature, which is not usually of any real importance. Oil changes cost more and the engine requires longer to cool off after it has been run. Additional oil capacity is helpful in a long race, providing the pickup is moved to the bottom to make all of the oil available for use. Additional capacity is insurance against losing an engine in the event that unexpected oil-consumption problems develop in a racing situation, or for engines on which the breathing problem has not been properly worked out. Big-capacity pans usually offer about 240 square inches of heat-radiating area, which is reduced to the equivalent of 24 square inches by surface polishing. In general, it can be said that an oversize pan is essential for a non-dry-sumped, road-racing engine.

5. Appearance. Most special aluminum parts are purchased for looks instead of function—that is, show, not go! Do not let your desires for a good-looking engine confuse you when final-assembly time arrives. Avoid polished fins! If you are tempted to retain them reread engineer Phil Irving's comments. If you already have such parts, "de-polish" them by sandblasting the polished surfaces. Black anodize the parts or cover the exterior surfaces with a thin coating of self-etching flat-black paint of the non-insulating variety. Black anodizing is a plating process that many plating shops can provide for you at reasonable cost. Incidentally, the black obtained by anodizing may turn out somewhat spotty as castings do not usually anodize perfectly. This will not impair the heat-removal characteristics. Although seemingly insignificant, these efforts will reward you with a cooler-running, longer-lasting engine. The same efforts should be applied to rocker-arm covers of the cast variety.

6. Better sealing surfaces. The machined surface of the pan that contacts the case bottom is much stiffer than the stamped steel original pan. The same is true for aluminum valve covers. Some are better than others. The stock valve cover gaskets have tabs that aid in retaining the gasket during installation. Some of the

Shirok Enterprises of Colorado Springs, Colorado, makes this high volume oil pump kit. It is very useful if you are using a front-mounted cooler and filter.



Output volume of the Corvair oil pump is boosted one-third by addition of special Otto Parts pump cover to house Chevrolet 409 oil-pump gears. Installation can be made without removing engine from car.

aluminum valve covers have the spaces for the tabs.

Drawbacks? The pan will hang down beneath the already low engine. Ground clearance could be an issue.

Improving the Oil Pump

As has been mentioned previously, improving the flow of oil reduces bearing temperatures. This statement assumes that the oil-pump capacity can be increased to provide the additional flow. Fortunately, the Corvair's pump is located so that it lends itself to a simple modification for increasing its output volume. A spacer can be installed to house the ⅓ longer gears from a 409 Chevrolet thereby increasing output to 12 gallons per minute (GPM) at 4,000 RPM. This spacer is an aluminum casting that bolts directly to the stock accessory drive housing. Such an adapter casting, complete with gears, is manufactured by Otto Parts.

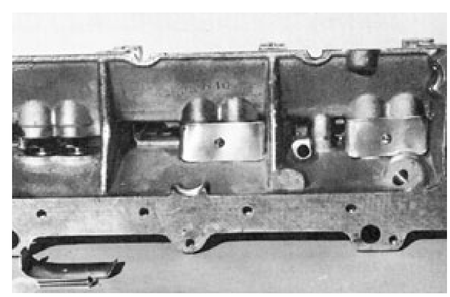
Although the 409 gears are 0.397-inch longer than the Corvair gears, the stock idler gear shaft can be used. The drive-gear shaft is relocated slightly to match with the Corvair's distributor-drive tang.

Oils

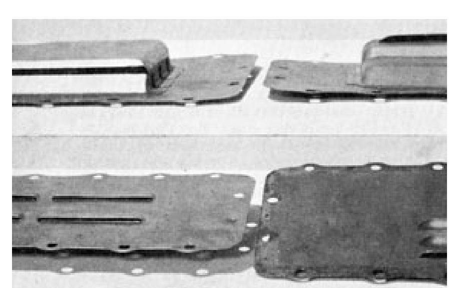
The Corvair needs the best oils to provide good viscosity under the extreme conditions of temperature encountered in an air-cooled engine, especially a modified one. Multi-grade oil acts like a 20-weight to reduce cold friction and retains the viscosity of a 40-weight oil as the temperature is increased. Shell "Rotella" oils, in various grades, have worked well in the Corvair. Don Eichstadt and other Corvair racers report good experience with D-A Speed Sport oils. There are several synthetic oils that work great in the Corvair, RedLine, Amsoil, and Mobil1 all have their proponents. The high-temperature capabilities of the synthetics are perfect to help the Corvair cylinder head temps in competition usage. If you decide to go with a synthetic oil in your new motor, I suggest you run the motor on normal non-synthetic oil for the first 500 miles or so. The extreme lube capability of the synthetic may prevent certain new parts, like piston rings, from mating with their counterparts, resulting in long-term oil consumption. There are still some non-synthetic oils that perform very well. Brad-Penn oil, from Pennsylvania sources is competition proven, it was previously marketed as Kendall Oil, a favorite of racers, but comes from the same wells and factory as the original Kendall. No matter which oil you choose, always change your oil when it is hot to get the best flushing action. Avoid oil additives as they may not be compatible with the additives that the oil manufacturer has used.

Internal Oil-Sump Baffling

Reference to the need for internal baffles in the sump has already been made in the discussion of special pans. Baffles extending to the underside of the crankcase separator wall, which separates the rotating parts from the oil supply, assist in drawing heat from the oil to the cooled cover and reduce oil from sloshing away from the pickup. In addition, still another set of baffles is needed for hard cornering as is experienced in autocrossing or road racing. While the pushrod tubes are protected from receiving oil from the crankshaft,



Splash baffles prevent loading rocker covers with oil in cornering with possible starvation of pump. Holding screw goes between lifter bores, exits inside crankcase. Use 1-½ inch 8-32 screw into tapped hole.



Two crankcase cover oil separators. Cover at left was introduced on Spyders in '62, was soon made standard throughout engine line. It reduces oil pull over into the positive-ventilation breathing system. Additional opening area is the secret of its success.

rods, and etc., there is nothing to protect them from receiving a literal flood of oil when cornering sloshes oil up the side of the crankcase walls from the sump. When oil rushes into these tubes to fill the rocker covers, temporary starvation of the pump can occur because of the quantity of oil that has left the sump. And, the valve-stem oil seals are swamped with more oil than they can handle. Elimination or reduction of the problem is easily accomplished by attaching short strips of aluminum to the separator wall to protect the tube openings from sloshing oil. One or two rivets will suffice for attachment of each shield. Leave ¹⁄₃₂ to ¹⁄₁₆ clearance at the outer edge next to the crankcase wall to permit normal drainage of the tubes. Make six of the shields from 0.030 or heavier aluminum, 1-³⁄₁₆ × 3-⅛. Don Eichstadt recommends the use of a single six-inch-long vertical baffle on either side of the pan to reduce the need for the splash baffles.

Doug Roe added an extra piece of sheet metal to the bottom of his oil pickup so that the oil about to enter the pickup will not be forced away from the opening during cornering. For the last 20 years, I have been running the Otto Parts pan, the Otto Parts baffle spacer and the companion pickup that drops the oil entry down to the very bottom of the sump. The baffle spacer prevents the oil from sloshing up into the tubes.

Doug Roe's oil pickup modification.

Crankcase Breathing

Corvairs made since 1963 include positive crankcase ventilation equipment. Models prior to that year could be so equipped, especially in certain states (California) that were working mightily to correct the smog problem. These systems effectively remove harmful, oil-contaminating vapors from the crankcase, thereby preventing corrosion and sludge formation. The use of these systems is very desirable on engines that are used for short trips or stop-and-go city driving. Keep the system clean and it will not, contrary to common fictions, reduce performance at all. In fact, taking it off can foul up the idle mixture if the system is coupled through a valve to the intake manifold.

Engines running in competition need additional crankcase breathing capacity to avoid the development of internal pressures which will blow oil past the seals and gaskets which close the engine. Of three specific approaches that have been used, two definitely do not work and should be avoided. If you want to cover the side of your engine with oil, mount one or more "big" breathers on each rocker-arm cover. Regardless of internal baffling or special plastic stuffing, no breather can hold back the flying oil mist which is inside of these covers. The valve covers contribute to the cooling of the engine because they are constantly bathed in a thin film of oil and the outer surface is exposed to cooling air. Adding a breather to the cover reduces the area available for cooling. The second non-working approach is the addition of a baffled tube to the oil-filler pipe. This tube is the recipient of high-velocity oil spray slung off the crankshaft. If you do not believe it, just take off the cap while the engine is running. Wear your old clothes and have a can of Gunk handy to clean up the engine and its compartment! The stock breathing tube cannot be used by itself, of course, because its tiny ⅜-inch I.D. creates high velocities of the escaping air/oil mist to carry out oil quite handily. The same is true of the dipstick tube that must be carefully gasketed or even plugged for competition to prevent oil from spewing out of that opening.

The reason all of the foregoing systems cannot work at high RPM is the fact that they provide openings with very small area. A satisfactory installation must provide adequate area to slow down the mist and sufficient length to permit the condensed oil to collect and drain back into the engine. Drag racers have the answer with their catch-tank breather. A one- or two-gallon catch tank has a baffle in the center, with outlets in the form of two to three oil-filler-type breathers. Two 1-inch or larger rubber hoses connect the tank to the engine, often to the front of the rocker-arm covers. A drain is provided in the tank so the oil can be removed at the end of each run. I ran a pair of large tubes, one from each side of the upper baffle, along with the stock tube, into a large breather up under the rear window. The breather drains back into the top of the valve covers. To meet the racing requirements, the system ends in a catch tank.

Automotive

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