Cosworth Vega MAGAZINE

OFFICIAL PUBLICATION OF THE COSWORTH VEGA OWNERS ASSOCIATION

P.O. Box 910, El Toro, California 92630 (714) 637-1537

NOVEMBER 1984

RELIVING ROUNDUP-84

Grand Sweepstakes winner Dani Maloy

"Go for the Gold" Roundup-84 was an exciting weekend of action-packed events. It was a time to greet old friends and old Cosworths we see only during this yearly event and to meet new friends and new Cosworths (well, new to us). A collage of photos in this newsletter provides some of the flavor of the weekend, thanks to Greg Scott, Roundup-84 photographer. The following story recounts the events of this memorable weekend.

Roundup-84 officially began on Friday evening with a regional directors meeting presided over by Phil Rust, 1984 President. The treasurer's report was presented by Clark Kirby, 1984 Secretary/Treasurer. Increasing our membership became the primary focus of the meeting. Several plans were made in this behalf — to advertise for membership in car magazines, to develop a sticker with club information to place in glove boxes of each car so that new owners can be informed about the club as cars are sold, and to not give out free technical or parts information to non-members so as to encourage them to join the organization for help as we have all done.

On Saturday morning we had a "fast-food on the move" breakfast in the hotel parking lot as cars were prepared for Concours d' Elegance judging. Two very well-received technical seminars — one by Pirelli Tires and the other by Valvoline were presented by factory representatives while the Concours judging was simultaneously taking place by Concours judges Ren Reugerbrink, Down the Road Enterprises, Bob Chin, and Bob Maloy.

Then we headed to the Cypress College parking lot for the Autocross. The Autocross is our very special event each year, one that tests the real performance capabilities of car and driver — what these race cars are all about. This year's event was set up and run very professionally by the local SCCA, thanks to the clout and influence we received from fellow SCCA supporter and Autocross-84 coordinator, Sy Scheinberg. The course was long with some tight corners, but once you got the hang of it, was a pretty exciting run. Not limited by the number of runs one could take, as is often the case with Autocrosses, we were able to increase our speeds with the "practice makes perfect" method.

After the Autocross, we caravanned to the beach for a picnic supper, but a surprise came to some who marvelled at the temperature and temperament of the Pacific Ocean on a summer August evening — cold and awesome. After being sufficiently beaten and thrown about by giant breakers (some of the sane opted for a game of volleyball instead) we settled around a fire-pit where baked potatoes and corn had been roasting and had a nice picnic supper. Thanks goes to Richard and Margaret Beyer for coordinating the beach event and preparing the delicious picnic supper. After supper, the group was presented with recommendations for a new slate of officers and organizational changes. We elected Mark Grimm of Morton, Illinois as President. Other officers elected included Clark Kirby, Vice-President of Membership and Finance, and Bob Chin, Vice-President of Merchandize and Promotion. After dinner entertainment included "mime skits" which were directed by George Harrington with members as actors.

Sunday morning began with a breakfast caravan to Carl's Jr. Restaurant. After our eyes were sufficiently opened by strong coffee and good nourish-

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cosworth vega

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LETTER FROM THE EDITOR

"I DON'T THINK I UNDERSTAND EVERYTHING I KNOW ABOUT THIS"

This piece of wisdom is frequently used by old-timer types around race car fabrication shops in Southern California, and, if you think about it for a little bit, sums up the situation we all find ourselves in with familiar material at one time or another. In short, just when I think there are no more "unique" solutions to Cosworth problems, or "strange" problems to arise, another one presents itself, and defies all of the rules of logic and well planned decision tree diagnosis.

Another name for this phenomenon is the "everything's right, but it's wrong." Has this ever happened to you? Let's say that your tachometer suddenly, and with no apparent reason, has started to do the cha-cha. On acceleration it's rock steady, but when you settle down to cruise, the rpm's are bouncing from 2000 to 5000, but the car is running just fine. What to do? The first suspected part is the control module, so you replace it. Yes, the car does run better, and that annoying "burp" you had is gone, but the tach still bounces all over the place. The idea of buying a new tachometer at a price approaching a small house terrifies you, so you replace the pole piece. Two hours later and several dollars poorer, you start the engine and go for a ride. Whoops! There it goes again!

You borrow a tach from your friend and it does the same thing, so you know the problem is in the ignition system. After replacing just about all of the bits and pieces inside the distributor your tach still has some interesting ideas about the number of revolutions per minute your engine is turning. What to do?

I would recommend that you read the material elsewhere in this issue dealing with a very similar problem. Sometimes the elegant (read most obvious) solution escapes even the experts. If you haven't obtained all of the past technical bulletins, I would suggest you do so. They aren't the "wisdom of the ages" but as far as saving a lot of time and effort with strange and wonderful problems, they ***are*** the answer. We learn more and more every day. And, as the cars grow older, a completely different set of complications arise. This isn't to say that Cosworth's have more problems than any other ten year old car. Probably less, on the whole. I'll bet that it's cost a Cosworth owner less money than a Porsche owner to keep his car on the road since 1975 . . . a lot less in fact.

Keep those Technical Bulletins and Letters to The Editor coming in. If the content is accurate, and has not been covered before, we'll print it.

Bob Maloy

MESSAGE FROM THE NEW CVOA PRESIDENT

To all of my fellow Cosworth Vega Club members—hello!

Having recently been elected President at the national roundup in California, I would like to introduce myself to all the members. My name is Mark Grimm. I'm 33 years old and I live in Morton, Illinois with my wife, Becky, and two boys, Brett and Paul. I have been a member of CVOA since the club was started by Bob Maloy. I have two Cosworth Vegas - one is #0920, a 1975 with only 8400 miles, and the other one is #3136, a 1976 set up to race in IMSA or SCCA classes.

As President I want to see our club prosper and grow for the betterment of all our members (and our cars!). This club has so much to offer a member, now, and especially in the future as these cars become true classics! Especially now, since the automobile industry has suddenly rediscovered DOHC, four valve engines.

In the past five years I have met many club members and have made lots of good friends. I'm looking forward to meeting many more, and expanding the circle of Cosworth Vega friends. I hope that I can, in this next year, help to unify the club and all of its membership. Also I would like to promote the Cosworth Vega with our automotive press. I have started to contact regional directors and some members at random to get different inputs. I want to have talked to every director within the next month. With this information I hope to make the club even more interesting for every member!

I want to publicly thank George and Clair Harrington for having Roundup-84. Having put on Roundup-82, I know what they went through, and they deserve an extra large thank you! Next year I hope to see everyone in Indianapolis!! Those people who have never attended a roundup have no idea the great fun that they are missing. There is something for everyone to enjoy!

In closing I want to encourage any member who has an idea, or wants to do something for the club, to do it - lets get involved! Call or write me anytime. My phone number is (309) 263-8828. Remember, this is ***your*** club. Let's all help keep this car alive and well in the automotive industry. This great little car that was built ten years too early is just starting to bring a lot of interest into automotive circles. Just watch all of the magazines in the next year or so! High performance four-cylinders are coming back!!

Mark Grimm,
President of Cosworth Vega Owners Association

ment, the caravan continued to the Malibu Grand Prix Raceway. Claire Harrington distributed tickets providing each person with four laps around the course driving mini go-cart type cars. The course was winding, much like a scaled-down Autocross, and provided an exciting challenge and unique type of event from past Roundups.

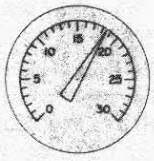
We returned to the hotel parking lot for an impromptu picnic lunch prepared by Richard and Margaret Beyer, then lined up for the Sunday afternoon road rally. The road rally consisted of a colorful trek through the California southland—the foothills, the condos, the ranches, the beach cottages and cliffhangers, the residential suburbs, and the business parks. To promote this years roundup theme "Go for the Gold", and to complicate what could have otherwise been a serene tour, we were asked to list every bank and savings and loan that we saw on the rally. Never believed that old saying that "money grows on trees in California" until we were blessed with the opportunity of counting the banks they keep it all in!!! Thanks to the following for assistance with the rally — Robert and Dani Maloy, Paul, Kaye, and Paul Cornell III of Scottsdale, Arizona, and Kevin McCarthy.

The final evening's events began with cocktails and proceeded to a banquet of wonderful taste-tempting delights. George Harrington hosted the banquet, welcoming us, introducing speakers, handing out door prizes, etc. Outgoing-President Phil Rust made a short speech, reminding us that Roundup-85 will be in Indianapolis next year.

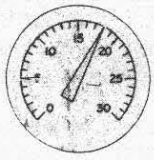
The guest speaker was Jim Hall, editor of ***Motor Trend*** magazine and owner of three Cosworths. Then came the distribution of trophies and door prizes. The winners of the trophies are listed elsewhere in the newsletter. Trophies and door prizes were plentiful with something for almost everyone thanks to the too-many-to-mention contributors. George and Claire Harrington spent a great deal of time in selecting unique door prizes that they donated and they included a $400.00 stereo system which was won by Paul Cornell III, a high-powered trouble light to use in a car, a modern multi-picture frame, and a host of other "weird and wonderful" surprises. Bob Maloy (Ram Engineering) donated over $500.00 in parts and other door prizes to the event. The Grand Sweepstakes Trophy for Competition and Sportsmanship was a gold-plated cam cover mounted on a 50" x 60" velvet background and gold framed, quite dramatic in presentation, and one that every Cosworth owner coveted! The cam cover for this trophy was donated by Bill Hutton of H.M.E., Clarksville, TN. Special huge (5 foot tall) and very dramatic trophies for "Best-Engineered", "People's Choice", and "Concours de Elegance" were donated by Ren Reugerbrink, Down the Road Enterprises. First thru third place trophies for events were gold, silver, and bronze to reflect the "Go for the Gold" theme.

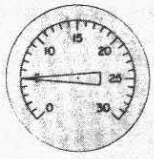
And so Roundup-84 came to an end. Thanks to George and Claire Harrington, this years host and hostess, for giving us a wonderful weekend which we can remember for the rest of our lives, along with other memorable Roundups in our past, and many more to come in the club's future. Thanks, George and Claire, for accepting the huge responsibility of organizing the Roundup, for the creativity that goes into making a Roundup unique, and for the attentiveness to detail that polishes otherwise rough edges on events. Roundup-85 will be hosted by Phil and Shirley Rust in Indianapolis, Indiana, and promises to be just as exciting. Make your plans early to attend.

A Vacuum Gage Is A Good Investment



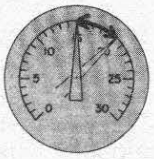
Steady reading between 15 and 22 in.-Hg with the engine warmed up and idling is normal (left, top). Snap the throttle plate open and closed suddenly. The needle should drop to 5 in.-Hg or lower before stabilizing at the normal reading between 15 and 22 in.-Hg (left, bottom).



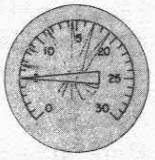


Low reading that holds steady around 5 in.-Hg indicates a vacuum leak at intake manifold or carburetor gaskets, or a disconnected or leaking vacuum hose.

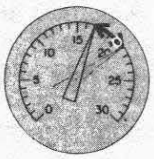
Low reading that holds steady between 8 and 14 in.-Hg suggests that ignition timing is off or that piston rings are leaking. Check timing and compression.



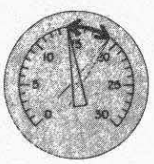
Fluctuating reading that periodically drops 2 to 6 in.-Hg below normal indicates worn points or low compression.



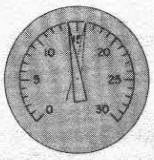
Regular fluctuation between a low reading of about 5 in.-Hg and a slightly lower-than-normal reading means the head gasket is leaking. See a mechanic.



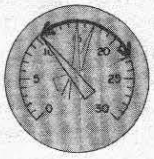
Reading drifts back and forth over a range of 4 to 5 in.-Hg within the normal range to indicate incorrect carburetor adjustment.



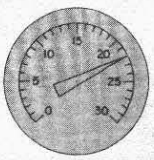
Rapid needle vibration between 14 and 19 in.-Hg indicates that worn valve guides are letting intake valves chatter as they seat. See a mechanic.



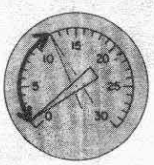
Needle floats over a range of about 14 to 16 in.-Hg. Suggests that spark plugs may be gapped too close after incorrect servicing. Adjust gap.



Needle that swings erratically between about 10 and 20 in.-Hg when the engine is accelerated smoothly may indicate weak valve springs. See a mechanic.



Steady high reading that holds above 21 in.-Hg indicates restricted air intake. Check for clogged air filter or a stuck choke.



Needle drops to near zero when the engine is accelerated, then climbs back almost to normal level. Exhaust system may be blocked or kinked.

GENERAL MOTORS INTRODUCES FOUR-VALVE ENGINE IN 1987

By Bob Chin

General Motors next attempt at a Four-Valve engine will be in 1987. Oldsmobile has been slated as the division to first have the dual overhead cam, four valve, four cyclinder powerplant. Also note that this engine will be a continuation of the current General Motors "hi-tech" engines. The engine will be used in a front wheel drive automobile. The details of the Oldsmobile "Cosworth" follows:

Bore Spacing 100mm (3.937 in.)
Bore Size ..... 92mm (3.622 in.)
Intake Valve Angle..... 20
Exhaust Valve Angle..... 22
Combustion Chamber
Shape..... Pent Roof
Hydraulic Valve Lifters
Separate Valve Covers for Intake and Exhaust
Spark Plugs offset 5mm to exhaust side of head
Siamesed intake and exhaust ports
Intake valve ..... 1.45 in. dia.
Exhaust valve..... 1.24 in. dia.
Fuel injector bores in cylinder head
Tuned intake manifold
"Hi-Tech" fuel injection with mass flow sensors
Total displacement 2.3L (144 cu. in.)
Cast iron engine block

Many details have yet to be seen. Oldsmobile is now sending out for tooling quotations.

EDITOR'S COMMENT –

I'll bet if A.Q. received four or five hundred letters of support for a Cosworth Vega feature it would get published!

Write to:

Lowell Paddock
A.Q.
221 Nassau St.
Princeton, N.J. 08540

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August 16, 1984

Dr. Robert A. Maloy
P.O. Box 910
El Toro, CA 92630

Dear Mr. Maloy:

Thanks for your note of July 9. As regards the number of Cosworths built, I regret the error and will defer to your evidence. I will correct the figure when we go to a second printing of the book.

Our thanks to you once again for allowing us to photograph your Cosworth. These cars have fascinated me ever since I bought a Vega GT, my first serious car, in 1976. With a typical outpouring of adolescent energy, I took care of the GT as if it was a Ferrari. Though I no longer look upon it with the same enthusiasm, I remain convinced that the Vega at heart was a very good car that might have led to some great things if it had been properly developed and built. Unfortunately, the only remaining evidence of Chevrolet's best intentions are the Cosworth cars. I hope to do an article on them in Automobile Quarterly at some future date and hope that I can call upon you for assistance at that time.

Sincerely,

Lowell C. Paddock
Senior Editor

The World's Largest Publisher of Automotive History
Automobile Quarterly Magazine and the Library Series of Marque History Books

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TECHNICAL BULLETINS

Date: September 11, 1984
Subject: ***Failure of single throttle return spring on Weber equipped Cosworths***
Part(s): Numbers Required: Inner and outer carb. spring. one each
G.M. Part Number #340638..... 52¢ (1)
#340637..... 52¢ (1)

Approximate Cost of Parts: $1.04 for both springs
Approximate Labor Time: Three minutes

For each of you who have Hutton Weber conversions, that has the single throttle spring (return) as supplied in the Hutton kit, there is a better spring available at a cheap price. If that spring breaks as mine did, due to metal fatigue, your engine goes to full throttle. Your only recourse is the ignition key. Changing to the G.M. double spring will require you to drill the hole in the Hutton supplied chrome bracket big enough to insert both springs. The springs pressure is not that noticeable, and this also meets SCCA rules for a double throttle return spring for your car.

Keith James 75-0092
Pocatello, Idaho

Date: September 9, 1984
Subject: ***Vehicle Identification Numbers***

The Vehicle Identification Number (V.I.N.) will determine the authenticity of any Cosworth. The following is a breakdown of this number: 1V77E5U191856

1	– Manufacturer's Identity Code (Chevrolet)
V	– Series Code (Vega)
77	– Body Code (2 Door, 4-passenger hatchback coupe)
E	– Engine Code (122 cu. in. dia.)
5	– Model Year (1975)
U	– Assembly Plant Code (Lordstown, Ohio GMAC plant)
191856	– Unit Number

This V.I.N. would tell you that this car is a 1975 Chevrolet Cosworth Twin Cam Vega. The V.I.N. also would tell you that this is an early one. In this case, dash number 0039. The highest 1975 dash number registered by CVOA has a V.I.N. of 1V77E5U274601 (dash #2049). The 1976 Cosworths have V.I.N.'s of 1V7706U------. The earliest 1976 Cosworth registered by the Club is dash number 2062 with V.I.N. 1V7706U117525 (probably the earliest built 76 sold). The highest dash number registered by the Club is #3504 with a V.I.N. of 1V7706U246983.

Clark Kirby, Arlington, TX.

Date: October 20, 1984
Subject: ***Faulty "Freeze Plugs" May Cause Overheating***
Part(s): Numbers Required: None

Engines have been known to overheat and "freeze plugs" to begin leaking when coolant becomes low in your radiator. A "freeze plug" is a round metal plug, nearly two inches in diameter, which fits into a hole left after the engine block is cast at the foundry. In the casting, sand or other material is used to prevent the molten metal from clogging passages where the coolant is to flow once the engine is operating in the car. The sand core is then drained out of the holes.

The freeze plug gets its name from its main function — to pop out of the block should the coolant freeze in the engine. This is intended to prevent the frozen coolant from cracking the block, but you can't count on a freeze plug saving your engine if you forget to keep fresh coolant in your radiator.

The plugs also have another function. They are supposed to act as a "sacrifice" metal if the engine coolant begins to corrode the inside of the block in a chemical-electrical process known as electrolysis. The theory is that the block can be preserved by designing the freeze plug, made of a different type of metal, to corrode instead.

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con't from page 6

The best way to prevent the corrosive process from starting is to change the coolant at regular intervals. The antifreeze that you mix with water for the car's cooling system contains additives designed to prevent engine rust and corrosion. But these additives lose their effectiveness after a while. We recommend that you drain and change your coolant every year at a minimum.

Bob Maloy, El Toro, CA.

Date: October 5, 1984
Subject: ***Oil Pressure, Oil Temperature, and Fuel Pressure Gauges***

One of my special interests in cars is the instrumentation. I have added three gauges to complement the original equipment. I monitor oil pressure, oil temperature and fuel pressure. Both oil gauges are of the mechnical type while the fuel pressure gauge is electric, for safety reasons.

The following readings might be of interest to you. After initial engine warmup, about 4 minutes for the thermostat to open, oil pressure at idle, 1500 RPM, is 65 PSI. After about seven minutes at idle, the oil temperature reads just 140 degrees. Driving around town, stop and go type traffic, the oil temperature reads between 190-210 degrees. Oil pressure reads about 50 PSI with the engine oil now running 190 degrees, and at an idle of 1500 RPM. Around town driving the oil pressure reads between 60-65 PSI. I'm using 20-50 weight oil and change it religiously every 2000 miles, along with the oil filter. As far as I'm concerned, there is no cheaper engine insurance.

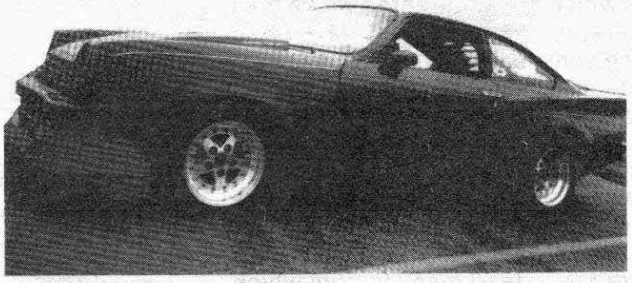
Regarding engine oil temperature, readings in the range of 240-280 degrees, for short periods of time, are not dangerous to the motor. You might encounter these readings on a hot day, in stop and go traffic. However, under normal driving conditions these readings would seem high and warrant a check of the engine and related cooling systems. Readings into the 300 degree range are not normal during routine driving. You should stop and shut down the engine if you suspect very high readings. This information is based on my own experience and I don't claim to be an expert when it comes to oils and their properties. Also, keep in mind that my engine is stock, with no modifications and I don't tow a trailer with it.

As for the fuel pressure gauge, the average reading is a fairly constant 40-45 PSI. The sender is mounted at the chrome fuel rail, just before fuel reaches the injectors. There is some fluctuation of this reading during normal driving. Anyone considering installing a fuel pressure gauge is reminded that under no circumstance should a live fuel line be run into the seating area of the vehicle. Use an electric gauge.

Danny Chieppa, Region I Regional Director

FOR SALE

The fastest Cosworth Vega in the world. 260 HP. Powered by a genuine Cosworth of England Formula II dry sump motor. No expense spared. This is the car of your dreams. Ford 9" rear end, spare 3.73 pumpkin, full stainless interior, cage, NASCAR four wheel discs, adjustable brake bias, 22 gal. fuel cell, Gotti 15 x 8 front, 15 x 9 rears. Goodyear Blue Streak racing rubber, 95% left. Tilt wheel, custom dash and full S-W gauges. Nomex Seat, 6 Point harness, $4000 worth of engine internal spares. This car is ready to go. Winner of the "Best Engineered Award" at Roundup '84. ***No serious offer refused.*** Must sell, I'm to old to go racing. This is the result of a six year developmental project. If you want a winner, this is it. Call me with your offer. Bob Maloy (714) 637-1537. ***INTERESTING TRADES CONSIDERED.***



UNDERSTEER and OVERSTEER

by Steve Russell
Pirelli Tire Corporation

No serious discussion of vehicle handling characteristics can take place without reference to the terms "understeer" and "oversteer".

These two terms are used extensively to define how a particular vehicle behaves in a cornering situation. Specifically, ***understeer*** occurs in a vehicle when the slip angles of the front tires are larger than the slip angles of the rear tires. ***Oversteer,*** then occurs when the slip angles of the rear tires are larger than those of the front. (See Figure 2.1)

Slip angle indirectly measures how well a tire is gripping the road surface in a cornering maneuver. (See Topic 2.1 Slip Angle) The larger the slip angle, the less grip the tire has on the road. Therefore, when a vehicle's front tires have larger slip angles than the rear tires (understeer), the front end of the car doesn't grip the road as well as the rear.

What all of this means is that the front end of a car that understeers will tend to push away toward the outside of a corner taken at or close to the car's maximum cornering speed. An oversteering car will swing the rear end out in the same corner. (See Figure 2.2)

Oversteer is generally regarded to be an unstable and therefore, undesirable handling characteristic in a car. The reason is that an oversteering car is much more sensitive to steering input (some people refer to it as "twitchy" handling). But more importantly an oversteering vehicle will reach it's maximum cornering speed much sooner than an understeering vehicle. When it does reach it's limit it is more likely to spin and much more difficult for the driver to regain control.

Most auto manufacturers produce cars which are engineered with a mild understeer condition. However, because some basic automobile designs produce inherent oversteer (such as cars with the engine mounted behind the rear axle), manufacturers attempt to introduce enough understeer in other areas of the design to balance out the handling characteristics.

There are indeed many factors which have a direct effect on slip angles and thus oversteer and understeer. Among these are vehicle weight distribution, suspension geometry, suspension componentry and, of course, the tires. Unless you are designing and building your own car, the weight distribution and suspension geometry are already locked in and unchangeable. That leaves suspension componentry and tires as the principal means of altering handling characteristics.

Changing suspension components (such as shocks, sway bars, springs, etc.) can alter a car's handling. However, choice of tire type, size, aspect ratio and construction will generally provide the fastest, easiest and most dramatic change in ultimate road holding as well as understeer and oversteer characteristics. The chart in Figure 2.2 lists some of the factors involved in tire selection and their effects on understeer and oversteer.

You do no have to be a high performance handling enthusiast to benefit from an understanding of understeer and oversteer. Virtually every car and driver on the road is eventually involved in an emergency driving situation. When these situations arise, the outcome frequently hinges on how the car responds to the driver's steering and braking input. Keeping oversteer and understeer considerations in mind when selecting tires can mean the difference between having an accident . . . or just a close call.

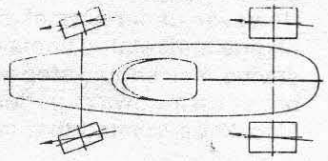
For instance, let's say that a driver has a car fitted with four radial tires of the same make, type and size. When his two rear tires wear out, he replaces them with two bias ply tires which he leaves on the rear. Mixing the radial tires with the bias plies is not advisable in any case but by putting the bias ply tires on the rear, the driver has induced an unstable, oversteering condition in his car. Now let's say that this driver is on a freeway when a car directly in front of him slams on the brakes. No matter how the driver reacts, the car's increased oversteer will make it extremely difficult to avoid an accident. If the driver decides to make an emergency lane change:

- The car is much more likely to spin.
- The car will break loose and lose control much sooner.

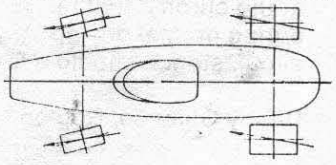
If he decides to slam on the brakes:

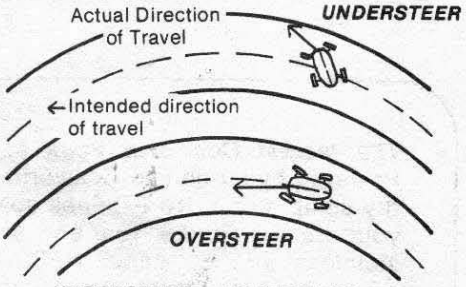
- The car will be much less likely to stop in a straight, controllable manner.
- Even if directional control is maintained, the car will require a much longer distance in which to stop.

Clearly, a basic understanding of understeer and oversteer will help make tire selection decisions which optimize performance. However, that same understanding can also protect against incorrect and occasionally dangerous tire misapplications.



UNDERSTEER CONDITION
(Front slip angle greater than rear)





UNDERSTEER and OVERSTEER 2.1

Fig. 2.2

CHANGING THESE FEATURES AS INDICATED	WILL INCREASE UNDERSTEER		WILL DECREASE OVERSTEER	
	Front	Rear	Front	Rear
Width	Wider	Narrower	Narrower	Wider
Ratio of Rubber to Void in Tread Design	Higher	Lower	Lower	Higher
Aspect Ratio	Lower	Higher	Higher	Lower
Overall Diameter	Taller	Shorter	Shorter	Taller
Construction	Radial	Bias or Bias Belted	Bias or Bias Belted	Radial
Inflation Pressure	Higher	Lower	Lower	Higher

con't on page 14

LETTERS TO THE EDITOR

Dear Bob:
I just had my Cosworth smog checked (in California). The test device would not check idle emissions at RPM greater than 1100. The mechanic used the clutch to get the idle speed within range, and after a minor adjustment of the MAP sensor and disconnecting the PCV valve, it passed. I called the information center and the end result of the conversation is that I should have been sent to a referee station. The reason for being sent to the referee station is that 122 cubic inch engine is not listed in their manuals. It still needs a certificate though.

Mike Garland, Northridge, CA

Beware all ye with Weber carbs in California! Ed.

Dear Bob:

Hi! I saw a photo of your Cosworth in the ***Automobile Quarterly*** and I can say your Cosworth is a great representation of what the Cosworth is. I sold my Cosworth in June and recently bought it back again. I never knew how much I missed it until I saw the car in his garage one day. I still remember the feeling I had in 1975 when I first saw a Cosworth in a Chevy showroom and how I felt when I could not raise the $1000 down payment for the car.

I have quite a bit of experience in traffic accident investigation and traffic enforcement. Even though I work in California, most of the laws apply in other states as well. Maybe I could give some rationale to some of the members regarding the logic that goes behind a ticket or help out regarding an accident that someone has had. Of course I would be speaking as a law enforcement officer and not as an attorney. Since the association is comprised of members interested in automobiles and automobiles are driven daily on public roadways where all sorts of rules and regulations apply, this might be a benefit for all.

Ed Wong, San Diego, CA

O.K. Ed! We're all ears. (Ed.)

Dear Bob:

Something to consider when you have an engine failure. My Cosworth, when it was equipped with the EFI, was prone to just quit running as if there had been a total electrical failure in the engine. The car sometimes would restart and at other times would not. This condition was discussed with the previous owner and I was aware of it when I bought the car. I had the car put on an engine analyzer and nothing was showing up that warranted immediate attention.

After about three thousand miles on the car, it really started to miss and die on the freeway. A few times I had to call the wrecker and have the car towed. After each of these episodes the car would be put on an electronic engine analyzer and nothing could be found that was wrong. Of course the Chevy dealer would not touch the Cosworth — in Tulsa. I even called the regional Chevy zone office, trying to locate a Bendix instrument to analyze the EFI system. I totally replaced the internal parts in the distributor and it did not make any difference.

I finally went to a Hutton Weber system because I felt the problem was in the computer. Just to be sure, I sent the computer to Bob Maloy and asked to have it checked out. Bob sent it back and said it was OK. Then I had the wiring harness out of the car that went to the computer. I checked that out with an Ohm meter and found nothing wrong. It really was a puzzle to me why the car would not run with the EFI. Since I had spent about $700 at this point for a new induction system I went ahead and used the new Weber system. The new system worked and occasionally there would still be a miss in the engine that was present when the car had the EFI.

I drove the car out to Idaho where I attend graduate school. The problem started to develop again, and a large amount of electronics had been bypassed, because I had removed the computer and the wiring. The car limped into Boise, Idaho and I went to a foreign car shop that had a dyno complex. I explained what had happened to the car and as they checked out the car, it was running perfectly. They asked me what I had done to get the car to restart. I told them that I pulled the cap and basically checked and looked for any loose wires, anyplace. Could not find anything, upon reassembly the car started. Whereupon I sought a good auto shop. What what was found by pure accident was the two wires that go from the coil into the distributor and attach to the loop that goes under the pickup coil and also plugs into the module connector was bad. Vibration would allow the wire to break internally and not show any outside damage. It also had shown itself because the tach would really make erratic movements when this wire would break continuity. The wire that was bad is/was the wire that attached itself to the module connector. I checked with Chevy and the replacement part cost $1.50 and of course nobody had the part in the North West part of the country. I ended up removing the wires from inside the rubber block that goes into the distributor housing ***(the problem was found to be wire separation within the rubber block)*** splicing in butt connectors and silicone jell to fill the void left from the removal of the rubber block. This allowed the motor to run without cutting out.

The way we checked this problem once we had found out the probable cause was: With the car on the dyno, with a load, and the wire before it was repaired and making a good connection, would not show any abnormal problems at all. Upon wiggling the wire while the car was running, the motor would suddenly lose power, like a light had been turned off. It was possible to shut off and restart the car by simple wiggle of the wires. If the car was stopped, at times it was impossible to get spark and at other times when the wire was making connection, spark would be present. Using the diagnostic charts in the Cosworth Vega book was of no help, because if you have spark to the plugs, you have to look else where for the problem when the problem is still the wires (they will make or break contact depending on vibration). After repair to these two wires, the engine could not be made to stop running.

I truly feel that the EFI system I took out of the car was working perfectly. The problem was a $1.50 wire circuit that did not act up at the right time when trying to find out what was wrong. So I spent $700 and it was a $1.50 item that needed to be replaced. When I get back to Oklahoma next year I am going to put the EFI back on, and I bet it will work.

Since owning two Cosworths and

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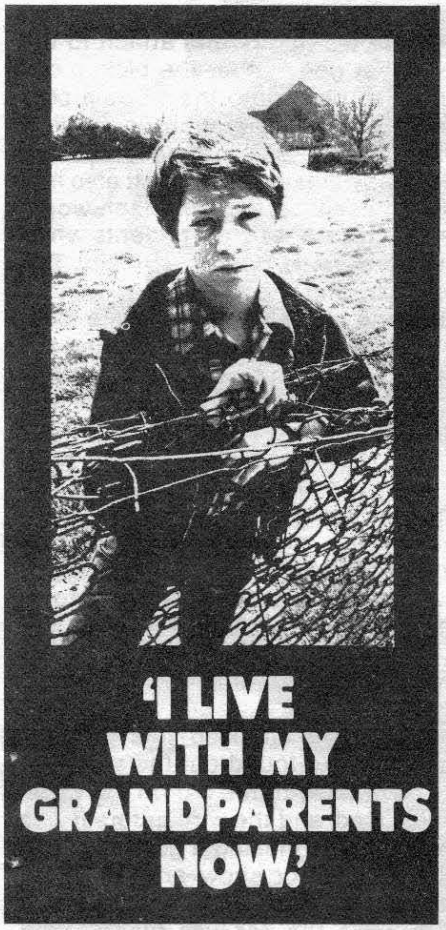
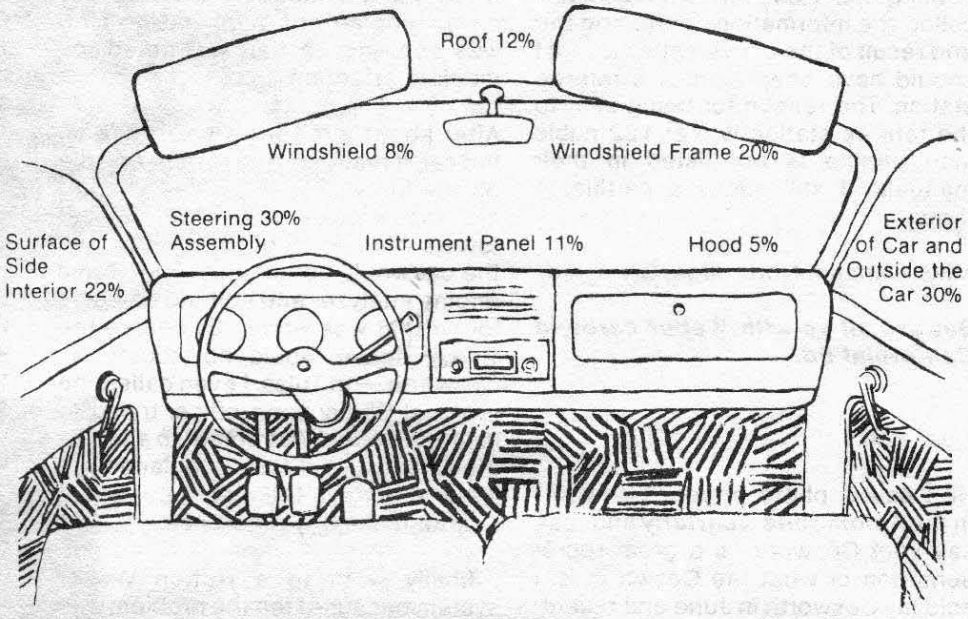


In an effort to reduce injuries and fatalities from second collisions, certain safety features are now required in car interiors — stronger windshields, collapsible steering wheels and padded dashboards, for example. Despite such improvements, you can still be injured or killed in a second collision with these surfaces. As the illustration shows, second collisions with steering wheels and windshields alone account for 38 per cent of the fatalities in automobile crashes.



Hard surfaces in a car's interior can become instruments of death during a crash. This illustration shows the percentage of unbelted occupants who are fatally injured in second collisions with various hard surfaces inside a car.

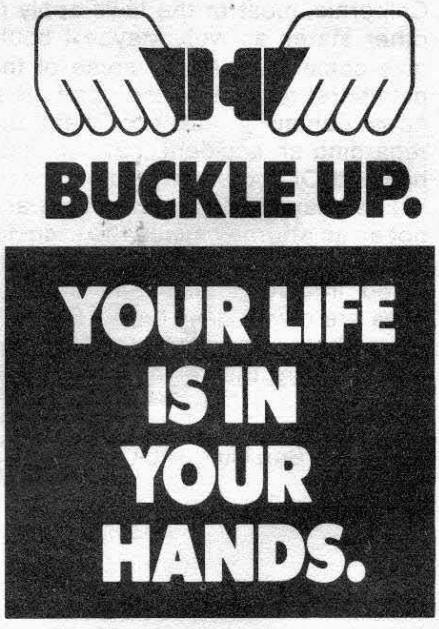
What Fastened Safety Belts Can Do for You

There are two types of safety belts — the lap belt and the lap-shoulder belt. When fastened, each type provides specific protection in the event of an automobile crash.

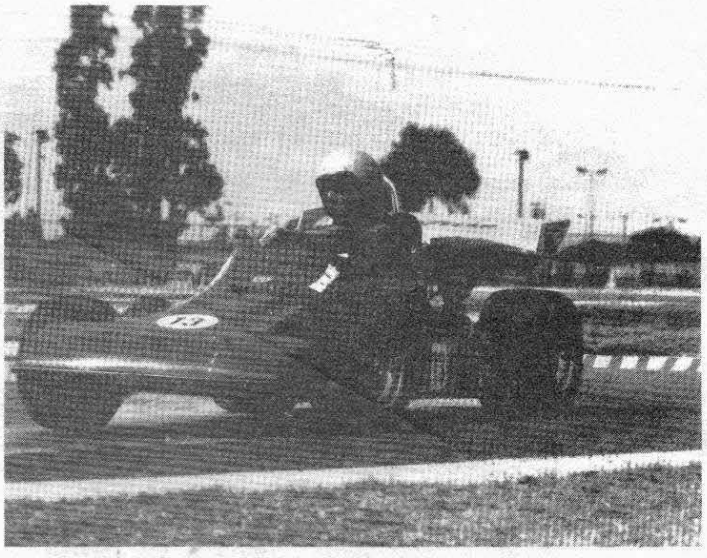
In a crash, a fastened lap belt dissipates the deceleration forces of your body across your hips. A fastened lap belt keeps you inside the car and protects you from the risks of ejection. However, it may not prevent you from striking the windshield, steering wheel or dashboard — especially in smaller cars.

A fastened shoulder belt provides additional protection. It dissipates the deceleration forces over a larger area of the body than just the hips alone. A fastened shoulder belt prevents your head and chest from striking the car's interior.

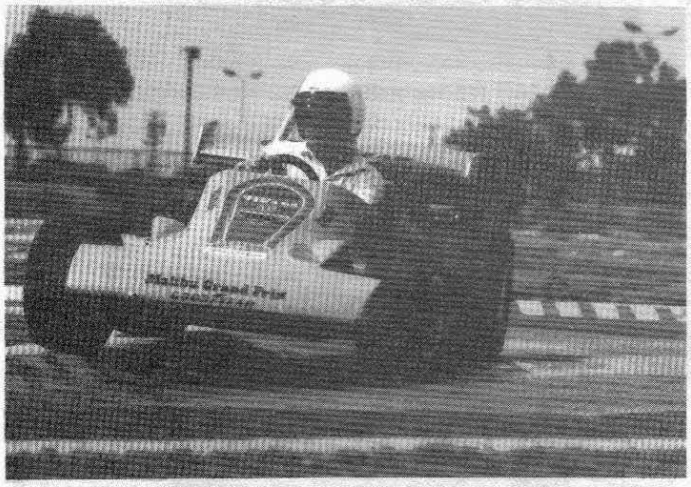
Some cars have only lap belts, but most cars have lap-shoulder belt combination systems. A few cars have an automatic shoulder belt system that operates in combination with a knee bumper so that no lap belt is needed. But unless the car you're travelling in has this particular system, you should never use a shoulder belt without using a lap belt at the same time. During a crash without a lap belt or knee bumper to hold you in place, you could slide out from under the shoulder belt and be choked by it. For maximum protection, you should fasten the lap belt *and* the shoulder belt whenever both are available to you.



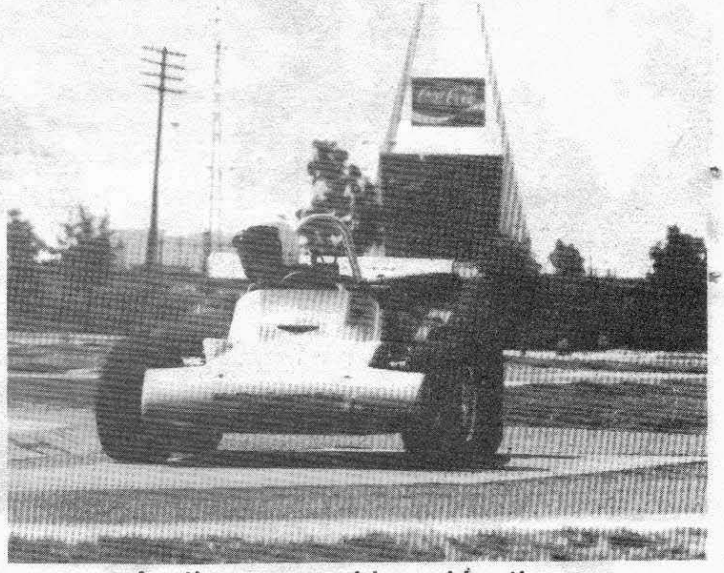
"Maybe body english will help"



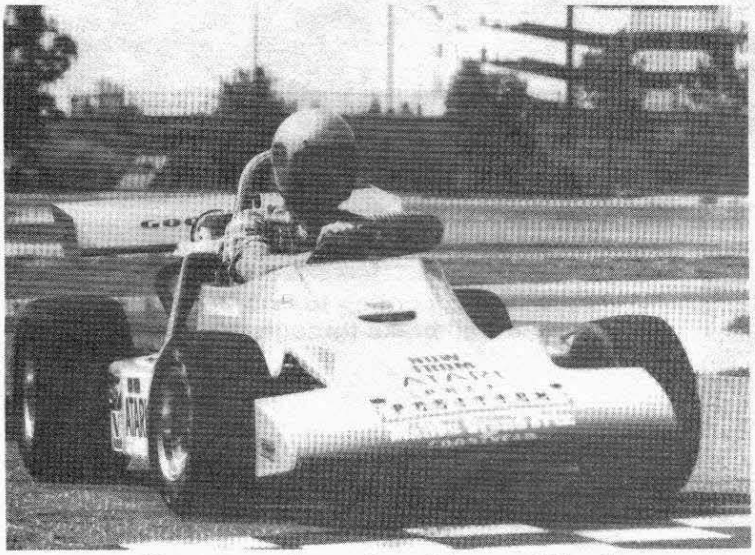
Mr. Smooth shows his driving style



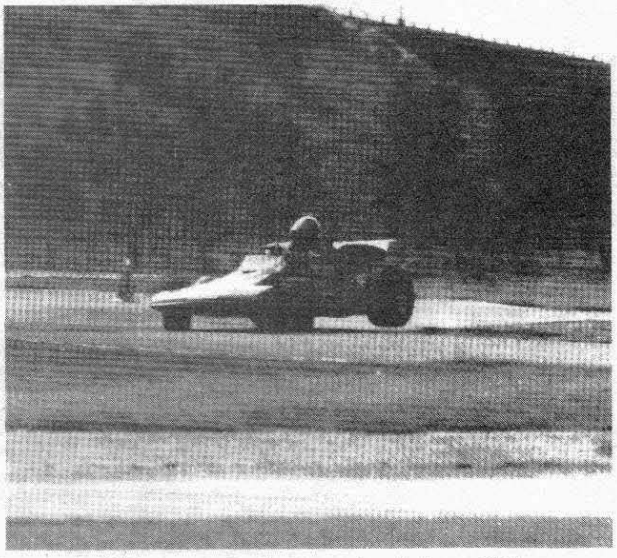
"If I just lean a little bit more-"



Another woman driver whips the men



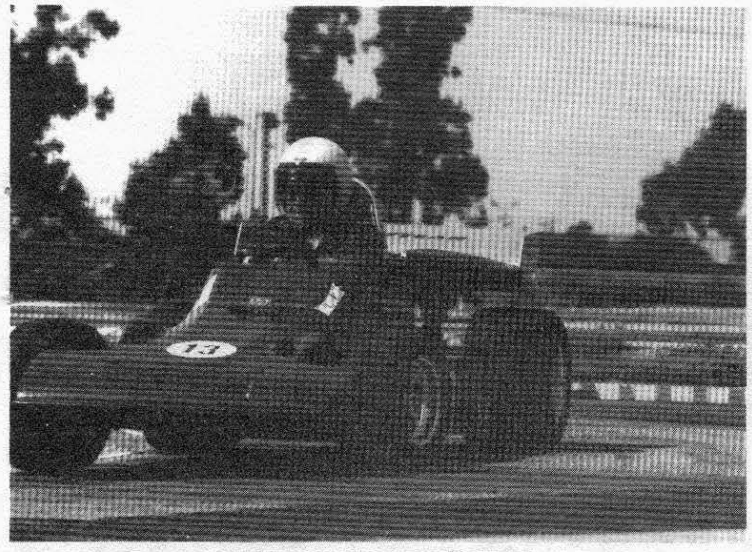
"How come I'm going right, and they're all going left?"



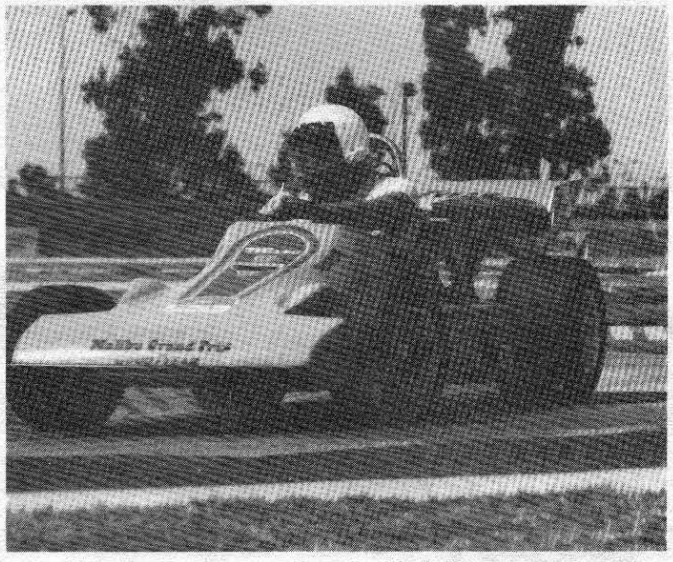
"Tower, am I clear for take-off?"

THE THRILL OF VICTORY

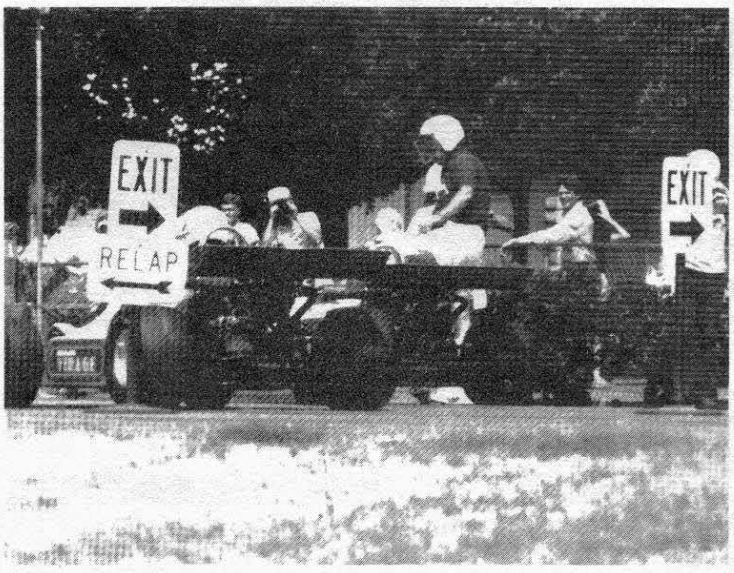
Jeff Romeo demonstrates terminal oversteer



THE AGONY OF DEFEAT



"Let's see, according to Bob Bondurant, I should trail brake through this corner"



Maloy makes book on the outcome

COURTESY OF COSWORTH ENGINEERING

Potted Cosworth history

Cosworth was started in 1958 by Mike Costin and Keith Duckworth (hence Cosworth), both young engineers working at the time for Colin Chapman at Lotus Cars. At first the company did not intend to concentrate on engines but rather on many different aspects of race car design and production. But Duckworth's strength lay in engine design and so it was that Cosworth became known as top notch engine builders.

The first engine, called the Mark I, was an experimental engine based on the 1-liter pushrod Ford engine. It lead to development of the first production engine—the Mark II, which was used in Formula Junior racing. By the time Costin joined the firm fulltime in 1963, Duckworth was hard at work on the Mark IX—a racing version of the Mark VIII, the engine built by Cosworth for use in the Lotus Seven sports car. Until 1972 all Cosworth engines were modified version of mass-produced Ford engines for use in road cars and various different racing formula.

It was in 1967 that Cosworth really hit the headlines when the Ford Motor Company in England provided Duckworth with 100,000 Pounds Sterling ($250,000) to develop an all new Formula One engine. Cosworth's first totally scratch built engine, called the Cosworth-Ford DFV, was an instant success and the present DFV and DFX engines are still basically the same as those first engines. The engine, which won, first time out, at the Dutch Grand Prix in 1967, developed 405 bhp. Nowadays the normally aspirated DFV is capable of producing 500 bhp while the turbocharged DFX engine can develop 700 bhp.

Since those days Cosworth has continued to grow and has expanded into areas of research and development for the whole auto industry. Apart from being the world's largest producer of pure racing engines, Cosworth has become one of the largest independent engine builders.

COSWORTH ENGINES

Engine	Size	Power	Year	Background
Mk II	997cc	75 bhp	1960	First production race engine used in Formula Junior.
Mk V	1340cc	80 bhp	1962	A road engine built for the Lotus Seven, based on the Ford 109E.
Mk VIII	1498cc	90 bhp	1963	Road engine, based on Ford 116E, used in the Lotus Seven, replaced the Mk V.
SCA	997cc	115 bhp	1964	SCA: Single Camshaft type A. The first extensively designed Cosworth engine. Based on Ford 116E, used in Formula 2. Won the F2 championship in '64 and '65.
MAE	997cc	100 bhp	1965	MAE: Modified Anglia series E. Large number of kits sold and used in Formula 3 racing.
FVA	1598cc	218 bhp	1967	FVA: Four Valve type A. Twin-cam engine used in F2. Based on Ford 116E, it won all F2 championships from '67 to '71.
DFV	2993cc	405 bhp	1967	DFV: Double Four Valve. Cosworth's first Formula One engine. Most successful F1 engine ever.
BDA	1601cc	120 bhp	1968	BDA: Belt Driven type A. Twin-cam, 16-valve engine based on Ford Crossflow. Design derived from FVA.
BDB	1700cc	200 bhp	1970	Development of BDA for rallying, sold in kit form.
BDC	1700cc	230 bhp	1970	Fuel-injection version of BDB, sold in kit form.
BDD	1600cc	200 bhp	1971	Formula Atlantic version of BDA, sold in kit form.
BDE	1790cc	245 bhp	1972	Formula 2 version of BDA.
BDF	1927cc	270 bhp	1972	Improved version of BDE.
EAA	1995cc	275 bhp	1972	Based on Chevrolet Vega engine. Cosworth's first non-Ford based stock-block engine. Similar to BDA in layout.
BDG	1975cc	275 bhp	1973	Improved version of BDF.
GAA	3412cc	440 bhp	1973	GAA: GA engine type A. (GA being merely letters in a new alphabetical code rather than descriptive of the engine) Ford V6 based, for Group 2 sedan racing.
BDH	1300cc	190 bhp	1973	Small capacity version of BDA for Group 2 sedan racing.
JAA	750cc	65 bhp	1974	Production motorcycle engine designed and built for Norton Villiers.
BDJ	1098cc	150 bhp	1974	Designed for SCCA Formula C.
BDM	1599cc	225 bhp	1975	Large valve fuel-injected version of BDD. Mainly used in hill climbing.
DFX	2645cc	700 bhp	1975	Turbocharged version of DFV for use in Champ car racing in USA.
BDN	1599cc	200 bhp	1977	Serialized BDD engine used in F/Atlantic racing in Canada and USA.
KAA	2400cc	240 bhp	1978	Rally version of Open Ascona 400 engine.
BDP	1975cc	235 bhp	1980	Fuel-injected version of BDA used in midget and off-road racing.
DFL	3955cc	540 bhp	1981	Bored out version of DFV for long distance racing. Manufactured under license for Ford.
BDT	1780cc	200 bhp	1982	Turbocharged version of BDB for rallying. Developed by Ford, and subcontracted to Cosworth for manufacture.

This list by no means includes every engine manufactured by Cosworth.
It is only a list of the significant engines produced over the years.

Merry Christmas

SLIP ANGLES, TIRES, SUSPENSION, ETC.

con't from page 8

By Steve Russell

Every time you turn the steering wheel of your car when you drive, your tires slip on the road surface. They may not always squeal or screech but they are always slipping to some degree. The common measurement for this phenomenon is "Slip Angle". Technically defined the slip angle is the difference between the plane of the wheel (the intended direction of travel) and the actual direction of travel. (See Figure 21.1) It is basically a function of three actions: the lateral force generated in cornering, relative sidewall flexing and scrubbing action of the tire's contact patch trying to maintain grip on the road surface. Generally speaking, it can be said that a tire which generates a smaller slip angle is "gripping" the road more effectively than a tire which generates a larger slip angle under the same circumstances. It should be understood that the slip angles a tire generates are affected by factors such as vehicle weight distribution and suspension geometry. However, this topic paper will only deal with the aspects of tire construction which relate to slip angles. While it is always difficult to generalize where tires are concerned, there are some general concepts regarding slip angles which can be useful.

For instance, given two tires of the same construction, tread design and tread compound; the wider tire will generate the smaller slip angle. All other things being equal, the tire with the shorter sidewall will generate the smaller slip angle. Finally, with two tires of the same overall dimensions, construction and tread rubber compounding, the tire with the higher "rubber to void" ratio in it's tread design will deliver smaller slip angles.

All of the above presume a dry road surface. Indeed, some of the construction characteristics which reduce slip angles in the dry can increase them in the wet.

While slip angles are not communly used for comparison purposes between tire manufacturers, understanding the concept of what a slip angle is can be of significatn value with regard to high performance tire applications.

The relationship between the slip angles of the front tires and rear tires directly affects the handling characteristics (understeer and oversteer) of any vehicle. For example, assume that you have a car that is designed for use with 185/70-14 radials fitted at all four wheel positions. If the two rear tires were replaced with 205/60-14. the handling characteristics could become significantly unbalanced. Even if all other aspects of the tires were identical, the slip angles of the wider 205/60-14 would be smaller than those of the narrower 185/70-14.

Through a working knowledge of the relationship between slip angles and vehicle handling, questionable tire fitments can be avoided.

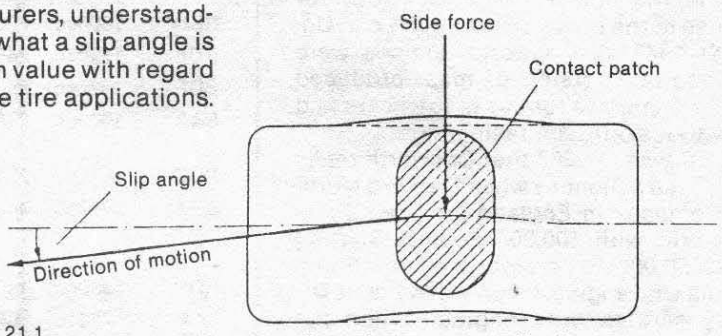


Fig. 21.1 Wheel running at a slip angle to create a side force.

Little tires, fast times – Darol Burgess.

COSWORTH TIDBITS

Gene Von Gunten knows of ***two Cosworths recently sold*** at auction. Both were original models, untitled, with low mileage. One sold for ***$8000*** and the other for ***$8100.***

CVOA will be advertising for new members in ***Motor Trend,*** and possibly in ***Hot Rod*** magazine in the coming months.

Thanks to ***Greg Scott and Darrol Burgess*** for contributing ***photos*** that were taken at the Roundup-84. Some are used in this newsletter.

In an article in the Youngstown, Ohio "Vindicator" newspaper where the Cosworth Vega was featured as a collector's car, the editor Robert Strange wrote ***"The Complete Book of Collectible Cars - 1940-1980*** by Richard M. Longworth and Graham Robson notes "the Cosworth has only 21 more horses than the regular 2.3 liter Vega." Other comments were ***"too little power for too much weight"*** and "prone to premature rusting". On the positive side, however, the book cites the car's rarity, technical interest, fine handling, neat looks and decent performance. Mr. Strange concludes that the Cosworth Vega is well on its way to becoming a car that future automobile collectors will relish. ***So much for "experts with the facts"!***

Rumor has it that ***Bob Chin*** christened his car with a new name after arriving back home from a trek across country to and from Roundup-84. He's now calling it ***"The Roadrunner".***

Clark Kirby tells us to be on the ***lookout*** for Cosworth ***#0898,*** which was ***stolen*** from a CVOA member's home (Frank Dalton) in Michigan.

Correction to ***errors*** in the ***parts listing*** published in the summer newsletter were provided by Patrick J. McCarthy, Poughkeepsie, NY. They are the following:

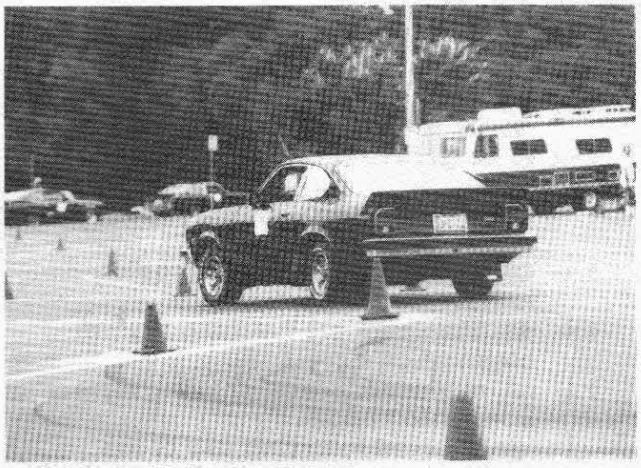
Group	*Part Name*	*Part No.*
854	Clutch Cable-75	361688
	Clutch Cable-76	364673
	5.858 Hub Cap (Discontinued)	465070

Gene Von Gunten states "If you hear ***strange knocking noises*** with your hood up, you may have loose exhaust header bolts. Check them—after they cool down.

General Motors is converting part of its three year old plant near Lansing, Michigan that makes 4.3 liter diesel engines for production of a ***new 16-valve, dual overhead cam*** four-cylinder gasoline engine. The 16-valve engine is planned for use in a range of GM cars.

The ***CPI*** (Value Guide to Cars of Particular Interest) is a sort of blue book for "luxury collectible cars" to provide a ***"reasonably accurate price"*** reference to those dealing with collectible cars. It lists the ***1975 CV*** average value at ***$3650*** and the ***1976 CV at $4100.*** These prices are based upon very clean cars, ones that are ready to drive and ready for resale.

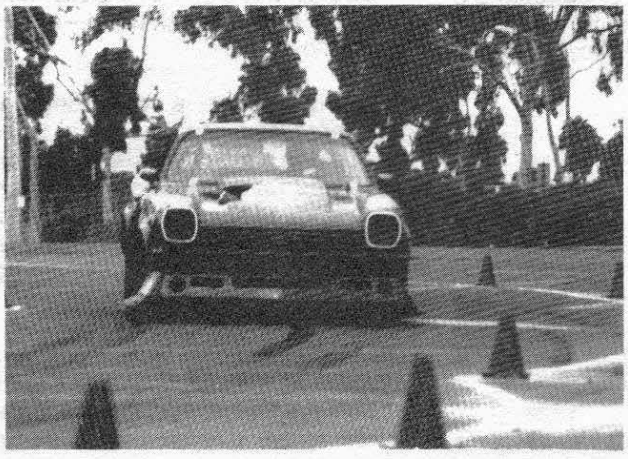
Greg Scott



Bob Chin

Duke Williams

Jeff Romeo



Bob Maloy

Carl Rumberger

con't from page 9

having to work on them all the time I have become fairly good at repairing them. Attention to detail and meticulous probing is about the only way to make sure Cosworths will stay running.

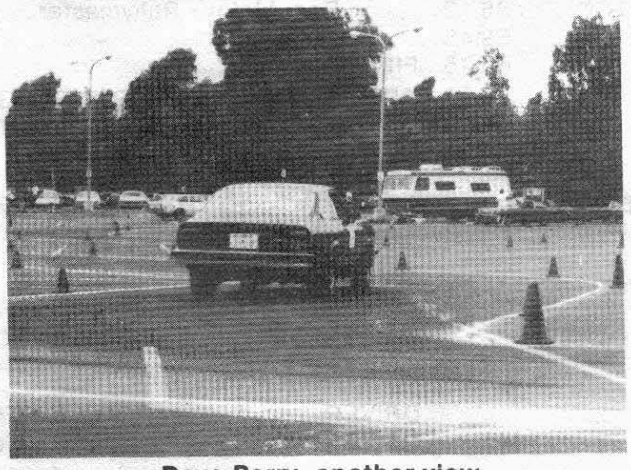
Keith James 75-0092, Pocatello, Idaho

Does this problem sound familiar folks? Ed.

Dave Perry gets a taste of Autocrossing

Darol Burgess

Dani "Fast Hands" Maloy Driving "Orange Julius"



Dave Perry, another view.

Debbie "Demon Driver" Thomas demonstrates a Ford product's superior handling and maneuverability

ROUNDUP RESULTS

GRAND SWEEPSTAKES AWARD FOR COMPETITION AND SPORTSMANSHIP

DANI MALOY

AUTOCROSS

WOMEN

1.	DANI MALOY	60.192
2.	JEAN KIRBY	60.496
3.	DEB THOMAS	61.929
4.	CLAIRE HARRINGTON	64.215
5.	LINDA PHILLIPS	66.524
6.	STACY WEEKS	75.302
7.	KAYE CORNELL	79.142

MEN

UNLIMITED

1.	BOB MALOY	53.001

CUSTOM

1.	DAROL BURGESS	54.871

MODIFIED

1.	JEFF ROMEO	57.138
2.	DUKE WILLIAMS	58.032
3.	PHIL RUST	58.102
4.	BRYAN GRAVES	59.940
5.	BENNETT TROUSDALE	60.177
6.	SEYMOUR SCHEINBERG	60.342
7.	STEVE PHILLIPS	60.658
8.	CARL RUMBERGER	61.171
9.	SAM DICKSON	62.506
10.	MILTON (Mike) GARLAND	66.315
11.	PAUL CORNELL JR.	66.530
12.	PAUL CORNELL III	77.486

STOCK

1.	DAVE PERRY	57.765
2.	JOE FRANSEN	58.270
3.	GEORGE HARRINGTON	58.992
4.	ROBERT CHIN	61.417
5.	ARTHUR CRITTENDEN	61.688
6.	MAURICE SCHECHTER	61.788

NON-COSWORTH

1.	CLARK KIRBY	61.709
2.	FRED THOMAS	62.683

PEOPLE'S CHOICE

(The Most Popular Cosworth at Roundup-84)

1. MAURICE SCHECHTER
2. GREGORY & CHRIS SCOTT
3. ED CLARKE
4. BOB CHIN
5. BENNETT TROUSDALE
6. PHIL & SHIRLEY RUST
7. DANI MALOY
8. DUKE WILLIAMS
9. STEVE & LINDA PHILLIPS
10. PAUL & KAYE CORNELL

MALIBU GRAN PRIX

MEN

1.	REN RUGERBRINK	56.68
2.	GREG SCOTT	57.60
3.	MARK ROCK	57.71
4.	DAROL BURGESS	58.08
5.	JEFF ROMEO	58.14
6.	MARC RUGERBRINK	58.26
7.	BOB CHIN	58.70
8.	CLARK KIRBY	59.04
9.	SAMUEL DICKSON	59.52
10.	GEORGE HARRINGTON	56.79
11.	BOB MALOY	59.99
12.	PAUL CORNELL, JR.	60.05
13.	DAVE PERRY	60.15
14.	CARL RUMBERGER	60.20
15.	PHIL RUST	60.21
16.	BRYAN GRAVES	60.21
17.	T. JOSEPH FRANSEN	60.35
18.	STEVE PHILLIPS	60.51
19.	KEVIN McCARTHY	60.75
20.	RICHARD BEYER	60.91
21.	ED CLARKE	61.23
22.	BENNETT TROUSDALE	61.35
23.	JAMES BORTOLOTTO	61.39
24.	ARTHUR CRITTENDEN	62.24
25.	MILTON (Mike) GARLAND	62.35
26.	SEYMOUR SCHEINBERG	62.59
27.	PAUL CORNELL III	66.43

WOMEN

1.	DANI MALOY	60.64
2.	LINDA PHILLIPS	62.19
3.	JEAN KIRBY	62.45
4.	STACY WEEKS	62.89
5.	CINDY COOK	63.24
6.	CHRIS CLARKE	63.93
7.	DEB THOMAS	64.54
8.	SHIRLEY RUST	65.96
9.	CLAIRE HARRINGTON	66.12
10.	MARGRET BEYER	68.45
11.	DONNA BOTT	68.75
12.	CHRIS SCOTT	69.11
13.	LISA SHEPHERD	69.75
14.	KAYE CORNELL	87.67

BEST ENGINEERED COSWORTH

BOB MALOY FOR HIS FORMULA II POWERED COSWORTH VEGA

CONCOURS

STOCK	POINTS OUT OF POS. 100
1. MAURICE SCHECHTER	86.5
2. DANI MALOY	83.5
3. BOB CHIN	76.0
4. JAMES PAULOS	75.0

MODIFIED

1. DUKE WILLIAMS	84.0
2. GREGORY & CHRIS SCOTT	83.0
3. PAUL & KAYE CORNELL	82.0
4. STEVE & LINDA PHILLIPS	73.0

CUSTOM

1. ED & CHRIS CLARKE	84.5

UNLIMITED

1. BOB MALOY

TOP 10 COSWORTH VEGAS-CONCOURS

There were six catagories, these represent the Top 10

1.	MAURICE SCHECHTER	86.5
2.	ED CLARKE	84.5
3.	DUKE WILLIAMS	84.0
4.	DANI MALOY	83.5
5.	GREGORY & CHRIS SCOTT	83.0
6.	PAUL & KAYE CORNELL	82.0
7.	BOB CHIN	76.0
8.	JAMES PAULOS	75.0
9.	STEVE & LINDA PHILLIPS	73.0
10.	GEORGE & CLAIRE HARRINGTON	72.0

FUN IN THE SUN RALLYE

Dani Maloy - Rallymaster

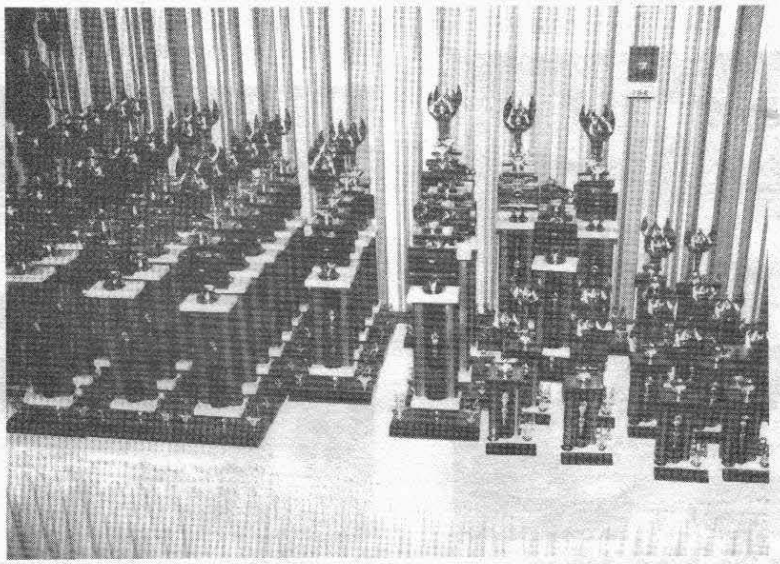
FIRST PLACE
DRIVER: CARL RUMBERGER
NAVIGATOR: JAMES BORTOLOTTO

SECOND PLACE
DRIVER: DAROL BURGESS
NAVIGATOR: BRYAN GRAVES

THIRD PLACE
DRIVER: DAVE PERRY
NAVIGATOR: DONNA BOTT

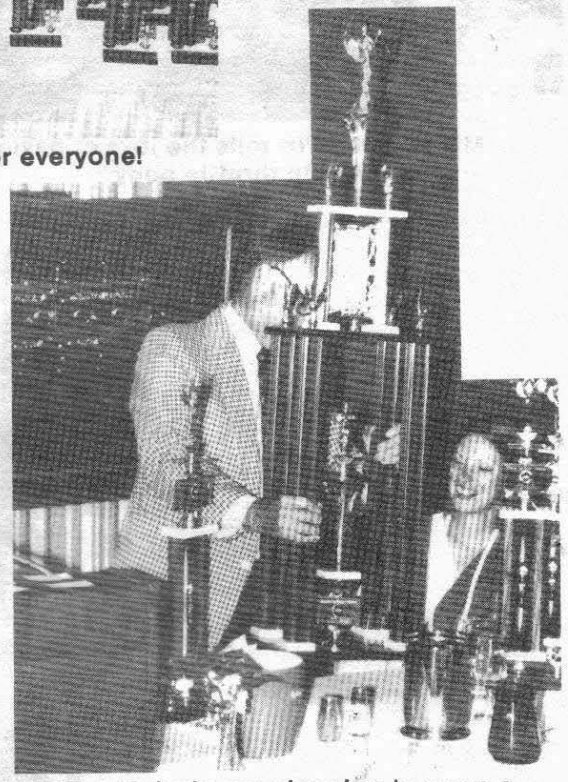
FOURTH PLACE
DRIVER: CLARKE KIRBY
NAVIGATOR: JEAN KIRBY

DEAD LAST
DRIVER: JEFF ROMEO
NAVIGATOR: LISA SHEPHERD



Something for everyone!

Why is Maurice smiling?



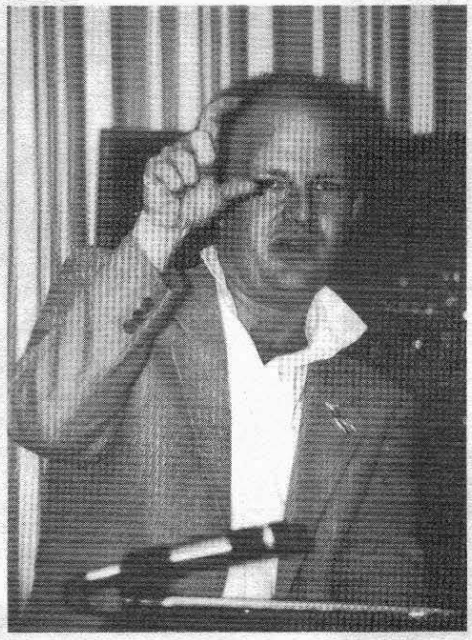
The Maloy's are planning to open a trophy store soon

Clark and Jean Kirby go for the groceries under the watchful eye of Mark Rock

Ren Reugerbrink denies that he's spent $12,000 practicing at Malibu Gran Prix

Mike Garland (r) tells the joys of having a big throttle body

The ladies agree not to further embarass the men by superior driving performance.



"How long, Jim?"
(Jim Hall, Motor Trend)

This sure as hell beats shushi!

The thundering herd at the watering hole.

REGIONAL NEWS

REGION I

Region I contributes some ideas about purchasing Cosworth, not just Vega parts whenever possible. Dick Lang, Regional Director, described a situation where a water pump and clutch cable were replaced with regular Vega parts. The ***water pump pulley*** had too few grooves causing grooves to wear off the timing belt. The firewall was cracked and split where the clutch cable went through because the ***cable was too short*** and it bound up when the clutch pedal was pushed due to the sharp bend in the cable. Cosworth clutch cables are available from Chevrolet - PN. # 364623 for 76 models, and 36188 for 75 models. The Chevrolet water pump with a nine-groove pulley is PN. # 364623 for 76 models, and 361688. TRW water pump - PN #FP1496. Be sure to double check that the part numbers are for 122 cubic inch engine to assure that the part numbers haven't changed.

REGION II

On November 4th Region II sponsored a day at Bridgehampton Race Circuit in the village of Bridgehampton, Long Island (at the tip of Long Island, New York). The famous Bridgehampton Race Circuit was the site of the original Can Am and Trans Am races. ***Time trials and a drivers school*** were held, and timing and scoring prizes were donated by Carbooks, Inc. of New York. A picnic and car parts swap were among the days activities on the island site of the most beautiful autumn leaves in America. The day concluded with cocktails and dinner at "The Drivers Seat" Restaurant.

REGION III

Region III has been expanded to include Pennsylvania, and is looking forward to getting acquainted with members from that state at upcoming events in 1985. The first annual fall picnic was held in October at a farm in Westminster, MD. It was enjoyed by CVOA members, family, and friends. In August Region III held an ***informal technical seminar*** at North Star Motors in Rockville, MD. This region also shares some tech tips with us: The Monza uses the ***same front seat*** tracks as the Cosworth, and nice cloth seats from wrecked Monzas could replace worn vinyl Cosworth seats. The back seat bottoms also work but the top of the back seat latches in a different location on the side of the interior panel. Some modifications will be needed to use the top.

REGION IV

Region IV has a new regional director - Fred Kieffer who recently published the following news to the Southeast region. "Recently I was selected as your Southeastern Regional Director. I have been a member of CVOA for three years, joining about a month after buying my Cosworth. My Cosworth has a firethorn interior on antique white paint with a completely rebuilt car/engine. As your director it is my job to build up membership in our region and I can use your assistance. I will be available to help with a problem on your Cosworth, and I plan to publish a small quarterly newsletter to the local region."

REGION X

Region X had their initial planning meeting in October for CVOA Roundup-85 to be held in Indianapolis next summer. The meeting was held at Phil Rust's home with some "breaking of bread" together. Region X will have a busy year and a tough time trying to outdo Roundup-84, but with an active group who have participated in past Roundups, they will probably have plenty of ideas. We all look forward to ***Indianapolis next summer.***

REGION IX

Region IX held an ***autocross*** with the SCCA in October at the Hilton Coliseum in Ames, Iowa. Region IX's boundaries have been expanded to include Montana and Kansas, so members in these areas are invited to participate in Region IX's activities and to contact Fred and Deb Thomas for any problems or questions about their car, parts, or the club.

REGION XIV

Region XV recently published a very nice regional newsletter which included several Cosworth maintenance recommendations from fellow CVOA members. We believe these could be of use to other members as well. It was mentioned that Carl Rumberger, Co-regional Director, Regional IV, says that ***coolant is very important*** to the life of the engine, that as the coolant breaks down it can damage the various metals used in the Cosworth block and head assembly. He recommends a yearly change to be on the safe side. On another subject, it was also mentioned that member Jay Bortolotto recommends changing the ***clutch cable*** at the first sign of binding. If the return rate on the pedal is sluggish, he explains, it might be time to change it. If ignored, this binding can result in the cable pulling right through the firewall.

REGION XVI

Ren Reugerbrink, explains that ***the oil return*** line from the distributor must be properly aligned, or the alternator drive belt can wear a hole in it causing an oil leak and possible engine damage if unnoticed. If the line is worn, it can be brazed by a local welder. He suggests that while you're at it to check the fittings for tightness, but be careful not to overtighten or you could snap them, especially the top fitting at the distributor housing.

WANTED

Wanted: One Goodyear Wingfoot P205/60R13; Prefer good to new condition; Call or write Ben Terwillegar, 372 Morman Rd., Hamilton, OH 45013 (513) 868-6582

Weber Carb set up for a Cosworth, 42DCOE's preferred. Need all of the bits and pieces to install. Call Mike Dillon, (404) 923-5110. Leave message if not in.

GM Front spoiler for Cosworth. Call Bob Maloy (714) 637-1537

Kenny Rogers without a beard
A.K.A. George Harrington, III

FOR SALE

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New Short Block, never used, plus other parts. All $1250.00. Call Paul Wicker evenings at (215) 227-1974. (PA)

'76-CV #2414. Absolutely immaculate perfect car. $2000 laquer paint job, o'haul and hi-pro valve & head by D.T.R. at 30,000 mi. $5500 O.B.O. Los Angeles area - Greg Scott (213) 372-5496.

WEBER ***Custom Built*** 50MM High Performance Carbs. Completely polished, including polished intake runners and complete custom linkage. OUTRAGEOUS!! Used on a prototype 2.5 litre Cosworth. Under 100 road miles. Terrifying performance. Not for Ricky Racer, but for a serious Cosworth owner who has done "everything else" to his motor. Sucks gas, goes like hell. $700.00, freight paid. Bob Maloy (714) 637-1537.

USED EVERYTHING!! Call Bob Maloy (714) 647-1537.

'76 CV #2440 Black, black vinyl, 5 speed, rear defog, swing out windows, AM-FM cassette. All new paint, upholstery, brakes and tires. Car cover and Cosworth tools. Runs & looks great. $4200 Jeff (916) 486-2558 Sacramento, CA.

H.D. Block PN #370750. New. $950 O.B.O. (916) 443-7664 Carl. Sacramento.

76CV 1696. Black, black vinyl, Rear opening windows, Console with vacuum, oil temp and pressure gauges. Pioneer stereo, equalizer, Chevy front and rear spoilers. $3,000 OBO Call Dave Haskell, days (617) 745-3378, eve's, (617) 937-4621.

Complete running Cosworth Motor, alternator, starter, all EFI including computer and harnesses. $1,000 OBO Dave Haskell see my ad for 76-1696 for phone.

Cosworth Vega club Tee shirts. Beautiful Black high quality Tee with gold "Cosworth Gear Logo" silk screened. If you have seen this at the Roundup, you know they make a great gift for yourself, or others. LOW, LOW PRICE!! Just $5.00 P.P. Call Dave Haskell, days (617) 745-3378 or eve's (617) 937-4621.

NOS Fitted Block, incl'd pistons, rings, pins, rods, bearings, still in the box. ID #T0910, Asking $995.00 or will swap for Buick/Olds 215V8, Older GM truck, or what have you. Call John Lucke, 152 C Street, Timberville, VA 22853 (703) 896-7602.

GENE VON GUNTEN SAYS –

We've got more used Cosworth parts than anybody. Good selection and fair prices. Be sure to check with us when you need good used parts. Call Gene between 5:30 - 9:00 PM E.S.T. at (301) 635-6435 for prices and availability.

A STUDY OF INDUCTION AIR FILTERS FOR STREET AND RACING ENGINES

FACTS YOU SHOULD KNOW ABOUT AIR FILTERS

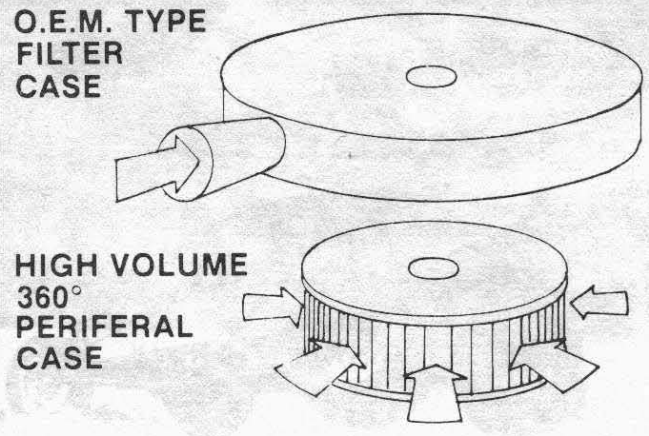
The primary function of an air filter is to supply an engine with clean air, a function which is so basic that it must be obvious to anyone with a little automotive knowledge. If this is so, why do we see so many engines, especially expensive, competition engines, without air filters? What factor can be so important as to override the basic need for an engine to have clean air for maximum life? The answer to that question is airflow. An engine's power output is proportional to the rate at which it can induce the air into the cylinders, and the torque output is proportional to the amount drawn into the cylinders on each induction stroke. All but the most minute restriction will cause an engine's power output to drop. Conventional paper elements and synthetic foam air filters can cause such a significant power drop that some engine builders are prepared to sacrifice the life of their expensive race engines for the sake of the extra power they can obtain.

It's not difficult to understand why an engine that runs without an air filter has such a short life. Useful life without an air filter depends on operating conditions, and in dusty, off-road conditions, an engine can grind itself to destruction in a very short time. On the other hand, a street engine, not encountering the severe conditions of an off-road vehicle, will not deteriorate so quickly. Even under near ideal conditions, however, the life of an unfiltered street engine is reduced to a point where it is financially uneconomical to run without an air filter. An engine which would normally run 100,000 miles or more when supplied with clean air may last only 40,000 miles without filtered air. In dusty or desert conditions, this mileage may be reduced considerably.

K & N air filters are designed to meet both the demands for an unrestricted flow of air and the ability to remove harmful particles and grit from the air. These two functions, as applied to various automotive and motorcycle applications, will now be dealt with to give you some guidelines to help you choose a proper air filter system, thus helping your engine achieve maximum engine life, more horsepower and increased gas mileage.

AIR CLEANER DESIGN EFFECTIVENESS

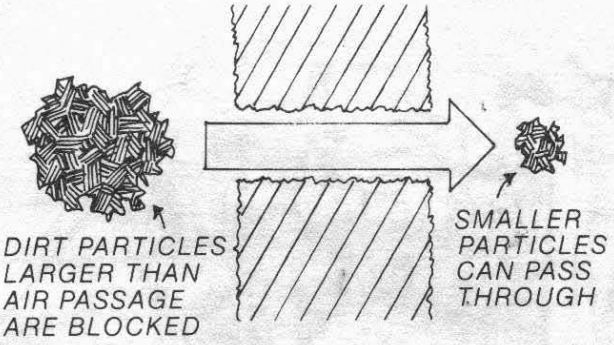
To design an effective air cleaner assembly, two factors must be considered: The air filtering element and the air filter element case. Original equipment type air filters tend to be more restrictive than the performance enthusiast would like, primarily because of emissions, silencing and installation requirements. The typical original equipment, temperature controlled, air horn filter case is far less effective at flowing air than a 360° peripheral feed air filter case that is the common design for most after market air filters. Replacing an original equipment air filter case and element with a well designed 360° peripheral feed air filter case and a filter element of almost zero restriction, usually results in an increase in horsepower of between 5 and 10% in a typical instance. An extreme instance may result in as much as 20% gain in horsepower, but such instances are rare. Equally rare are the instances where the increase in power is less than 5%. NOTE: All K & N open side hi-performance custom air cleaner assemblies are designed for hi-performance racing engines and off-road vehicles. They are not designed for use on street driven vehicles equipped with smog devices utilizing off the manifold air temperature control devices.



The K & N air filter element has approximately the same ability to filter out dirt particles as a paper element during it's recommended service life, depending on whose paper element the comparison is made. As far as cost is concerned, the K & N element is, unit for unit, more expensive than a paper element filter. However, it has an indefinite life and periodic cleaning and reoiling will restore it to a like new condition. Spark plugs have been reported to last 45,000 miles and oil stays cleaner longer, due to the ability of the K & N oil suspended element to trap and retain small particles of dirt.

A standard paper element with normal street use is recommended for replacement after only 10,000 to 20,000 miles. The entrapment of foreign particles from the air could cause a paper element to become up to 300% more restrictive if used past its design life. The K & N filter, with its totally different filtering design has been found in some cases to be less restrictive at the end of 100,000 street driven miles than most brand new paper elements.

GO/NO-GO FILTERING PRINCIPLE OF PAPER AND FOAM TYPE FILTERS



Most new synthetic foam element air filters, though having a longer life than paper because they can be cleaned, normally have less air flow capacity than clean paper air filters when compared size for size. One advantage foam elements have over paper elements is that they have a lower clog rate in severe dusty conditions. Both paper and foam type filters are more susceptible to reduced air flow when exposed to high moisture or water contamination. Under the same conditions, a K & N filter should show no restriction and actually show increased performance because of humidified air (due to rapid evaporation of water on the cotton filter material).

Any type air cleaner element can be made to flow sufficient air with minimal restriction if it is made large enough. Where space is limited, as in almost every automotive and motorcycle application, only a technologically advanced filter design will give maximum air flow consistent with acceptable size.

OFF ROAD APPLICATIONS

For an off-road car, the prime function of an air filter is to clean the air. Without clean air, the engine may not last the length of a race, and to win, first you must finish.

The second function is to supply the engine with as much clean air as possible, for as long as possible. You may well ask, "Why not use a stock paper element air filter?" Paper element filters are readily available, seemingly cheap and they do filter the air, although in many cases the air flow capability is restrictive. Unfortunately, the mode of operation of a paper filter is not the most suitable for off-road application. Such filters remove dust particles from the air by virtue of very, very fine holes in a wax impregnated paper. These holes become clogged very quickly with fine particles and the airflow restriction increases dramatically. In a 500 mile race, this restriction can result in as much as a 30% loss of horsepower, and higher fuel consumption proportionate to the rate of restriction, plus time lost to replace a paper filter two, three, sometimes four times during the race. Due to an entirely different mode of operation, which will be discussed later, the K & N air filter, in many cases, can have a layer of dust up to 1/8 inch thick without dropping the horsepower or fuel mileage significantly below that achieved by a standard, clean paper element air filter. Such efficiency normally allows a typical off-road event to be run without any attention to the air filter.

AIR FILTER LOCATION

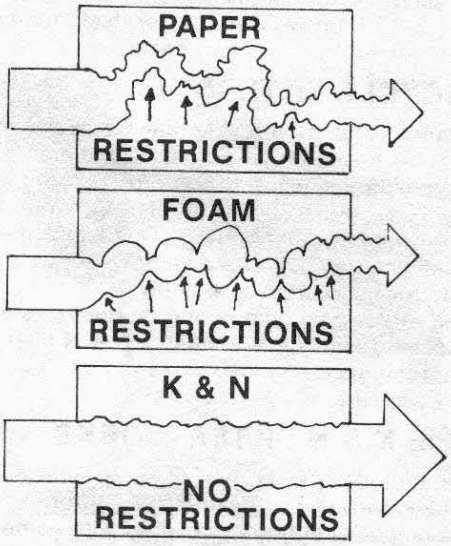
Here at K & N, experience has shown us that many off-road racers are unaware of the importance of the position of the air filter on the rear engine dune buggies. The air filter, if at all possible, should not be located directly inline with a wheel, or in some low position where it can collect thrown-up debris. The best locations are remote mounted, high up and forward of the center line of the rear wheels, out of the dust stream as much as possible. If a remote filter is not possible or practical, and a direct mount air filter is used, sometimes a deflection shield around the element to protect if from flying debris is helpful.

DRAG, CIRCLE TRACK AND ROAD RACING

For types of racing where horsepower is of prime importance, a correctly designed air cleaner can be of great value. If the restriction to air flow is minimal, by virtue of a correctly designed and sized air filter case and element, increases in horsepower can be obtained over that achieved by open intakes.

RELATIVE COMPARISON OF AIRFLOW PATTERNS THROUGH FILTER MEDIUMS

MECHANICAL RESTRICTIONS TO AIRFLOW INCREASE VACCUM PRESSURE AND REDUCE AIRFLOW VOLUME.

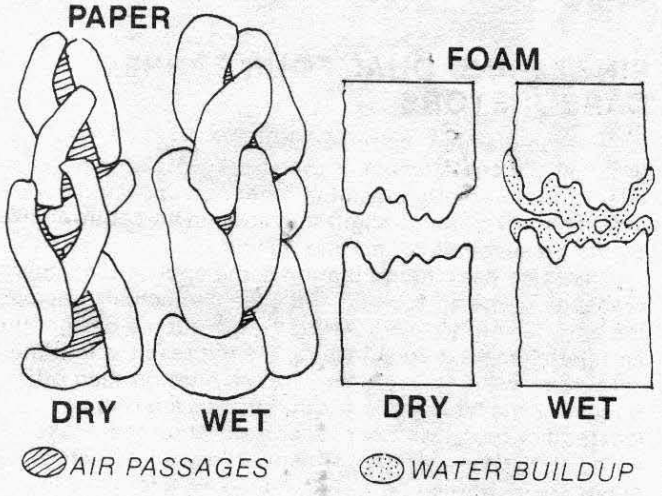


As a secondary, but equally worthwhile benefit, engine life can be considerably extended. It is often thought that on road race courses, the amount of dirt encountered by the air intakes of the engine is minimal. This is not so. To prove the point, install an air filter for one race. If the car in which the filter is installed has to follow another car for any period of time, the air filter will collect a considerable amount of grit, asphalt and rubber, all of which would normally have been ingested by the engine. In the process of a long road race, the effect of road debris on rings and valves can reduce the horsepower far more than any possible small reduction that may occur with a free flowing air filter system. Considering that air filters cost a lot less money than race engines, you can see there is a very real argument for using air filters, even on asphalt race cars.

On engines with open intakes that are exposed to the rapidly moving airstream around the car, certain extraction phenomena can take place. Air moving rapidly over an open carburetor intake tends to pull the ingoing charge back out (similar in operation to a cheap spray gun), thus reducing the volumetric efficiency of the engine. To get maximum air into the cylinder, an engine needs to draw air from a relatively stationary source, or at least a source of air which is not moving significantly faster than the engine would normally pull it in. This point is demonstrated by the fact that many NASCAR stockers are using air filters to slow down the air over the carburetor intake to achieve more installed engine horsepower.

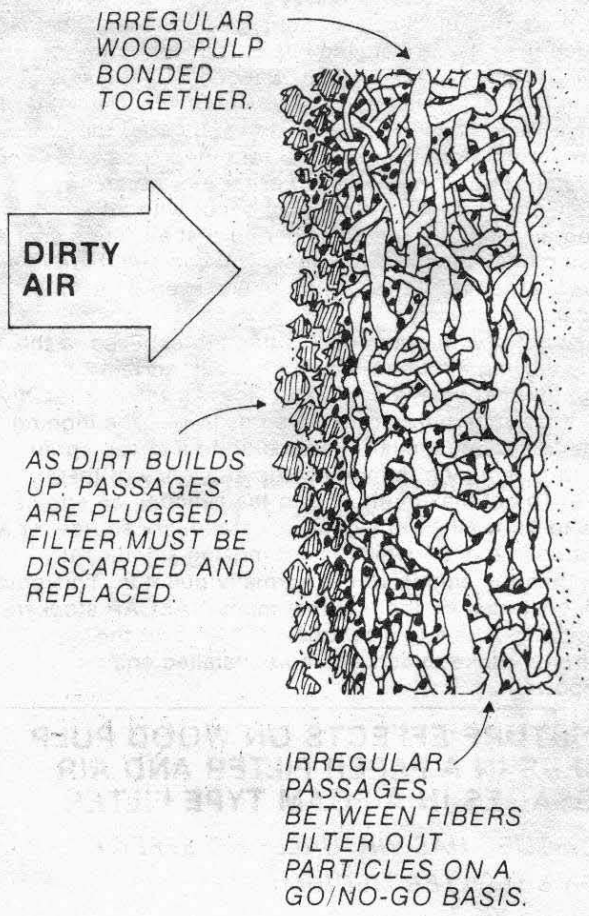
MOISTURE EFFECTS ON WOOD PULP FIBERS IN A PAPER FILTER AND AIR PASSAGES IN A FOAM TYPE FILTER

(MOISTURE HAS VIRTUALLY NO EFFECT ON K & N FILTER MEDIUM)

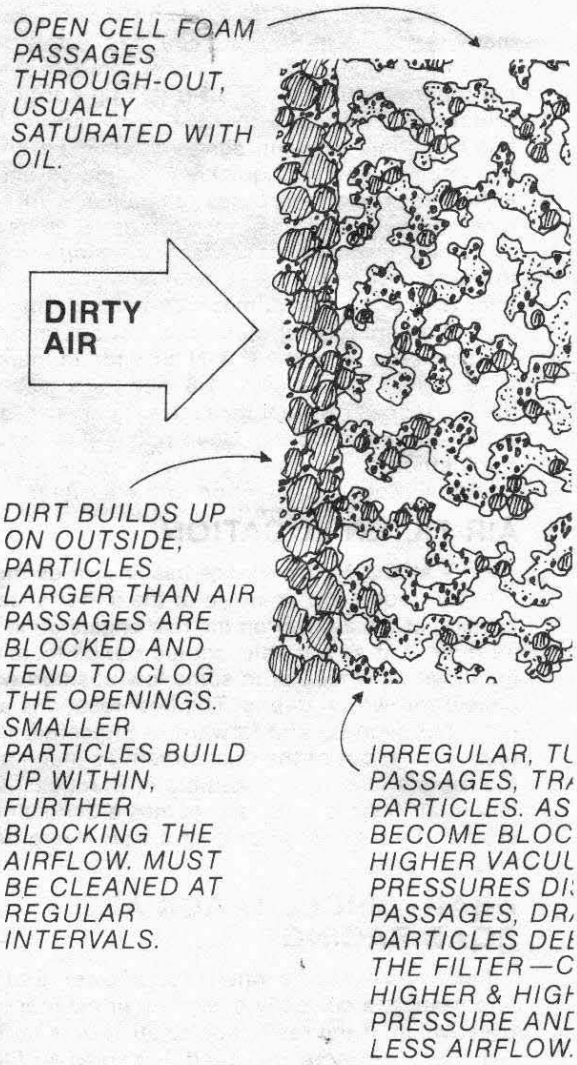


On injected engines with individual velocity stacks, where the ends of the stacks are in close proximity, it has been found that the shock wave from one stack can interfere with the shock wave from another stack, and, at certain points in the RPM range, it can reduce the horsepower. The addition of K & N air filters to the ram tubes cause the shock waves to be contained and be more effective. Reduced interaction of one stack with another is also an added benefit. Additionally, flow bench studies have indicated an unexpected increase in air flow when K & N air filters have been clamped to ram tubes. This adds up to a worthwhile increase in engine horsepower output, typically in the region of an extra 10 to 20 ft. lbs. of torque. (Reported from dyno tests on 350 Chevy sprint car engines.)

TYPICAL PAPER TYPE FILTER



TYPICAL FOAM TYP



SINGLE AND DUAL FOUR BARREL CARBURETORS

On large diameter extremely free flowing air filters, we find that the containment of the shock wave within the air filter casing can often result in a net horsepower increase, including any possible slight reduction in horsepower given by the presence of the air filter element.

It has also been found that on some applications, the presence of the air filter lid and base can actually increase the air flow into the carburetor. If, with such a design, the air filter element is free flowing, the net result is that the carburetor will flow more air with the filter on than off. Such an installation requires that the air filter lid be located not too close nor too far away from the intake horn. Unless the air filter element is very unrestrictive, it is not possible with a conventional type air filter case to bring the air filter lid close enough to be effective in helping flow into the carburetor. Under these circumstances, only a very free flowing element can be used to gain additional flow into the carburetor.

STREET APPLICATIONS

A high performance street engine has similar requirements to the drag race, circle track or road racing machine, but some additional factors should be considered. For street machines, we need an air filter of an adequate size to flow the required amount of air, without being so large as to cause installation problems. It also needs to have a long period between services if possible, and lastly, it needs to represent good cost to effectiveness ratio. The K & N filter fills all these requirements. Because it can be cleaned and reused, the K & N filter is a one time purchase, whereas conventional paper element filters must be replaced at regular intervals, usually 10,000 to 20,000 miles. Apart from being able to supply greater amounts of clean air for a longer period of time, resulting in more horsepower, added gas mileage and longer plug, oil and engine life, a K & N filter will, over the lifetime of the vehicle, pay for itself numerous times by eliminating replacement costs.

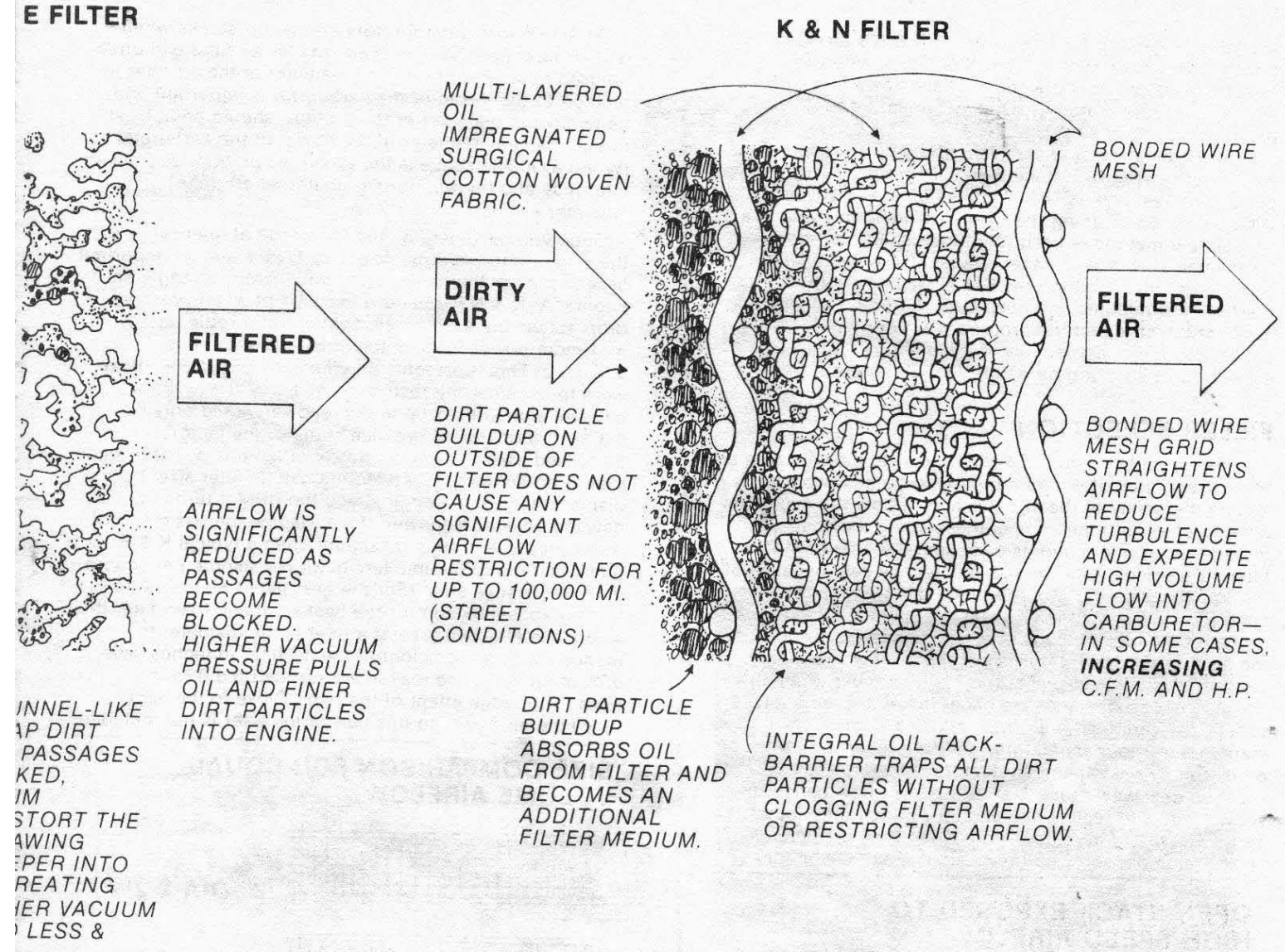
MOTORCYCLE FILTERS

On a smaller scale, motorcycle filters operate on the same principles as the larger automotive filters. On the modified applications, using K & N direct mount, clamp on type air filters, the air flow will often be found to be greater than when no filter is used. This factor must be kept in mind when adjusting the carburetor mixture to compensate for the increased air flow.

On street, dirt and all type racing motorcycles where performance and mileage is a must, a K & N filter meets all the requirements demanded of a modern day motorcycle engine.

HOW THE K & N FILTER WORKS

The typical mode of operation of an air filter is to provide a tack barrier for the air to pass through. A tack barrier is a mechanical barrier covered with some sort of



sticky compound. In the case of some paper air filter elements, it can be seen that the paper used in their construction appears to have a greasy texture. This, in conjunction with millions of very fine holes, causes the dirt particles to be screened out of the air. The thinner the paper filtering material, the finer the holes must be to remove the particles. The finer the holes, the quicker the element will clog up under severe conditions. Foam filter elements work on a similar principle, but because the thickness of the filter material is much greater than the paper one, the size holes in the foam filter can be much greater to achieve a similar filtering effectiveness. Most foam filters will use some sort of tack barrier, such as oil, to collect particles, but some are run dry. Tests have shown that this sort of filter will normally function somewhat longer than paper under severe dust conditions; however, it would steadily increase in restriction, eventually clogging, and may allow dust particles through it.

The mode of operation of the K & N air filter is somewhat more complex and requires more thought to understand its total function and filtering ability. This unique design concept features a special cotton fabric, used to suspend oil for the purpose of attraction and holding airborn dirt particles. These dirt particles, by virtue of the air moving through the filter at a low velocity (due to very little restriction), cling to the outside of the filter to actually become a part of the filtering media. The cotton fabric is sandwiched between pleated aluminum screen wire that exposes approximately five times greater surface area over the total circumference of the filter. This added area aides in more dirt holding capacity and less restrictive air flow, which results in many, many miles of use without servicing, plus increased power and gas mileage.

When a K & N air filter is clean, the air flow and filtering capabilities are very high, and remain so, for an extraordinary period of time. As the filter begins to collect debris on the outside, from the atmosphere, an additional form of filtering action begins to take place. Because there are no small holes to clog in the filter element itself, the large and small particles adhering to the outside of the element, held by the oil, begin to form a filtering barrier. As oil from the filter element attracts and retains the particles, they form an open tack barrier type filter. This can be illustrated by using a large pile of rocks as an example. Incoming rocks striking the pile are retained by the mass and do not enter through the mass, although air is free to pass around the rocks and flow through easily to its source of suction. It is not until very fine particles clog this secondary open tack barrier filter that the air flow capabilities of a K & N filter begins to drop. In some reported cases, large street driven trucks have gone over 100,000 miles with no need for cleaning or servicing of the K & N filters. In most cases, 1/8 to 1/4 inch of debris may be required to reach a point of significant flow reduction

to require cleaning. Air filter tests on K & N's air flow bench have shown that some K & N filters, with over 100,000 miles of street driven use, have flowed as much, and in many cases, more air than a similar sized new paper air filter element.

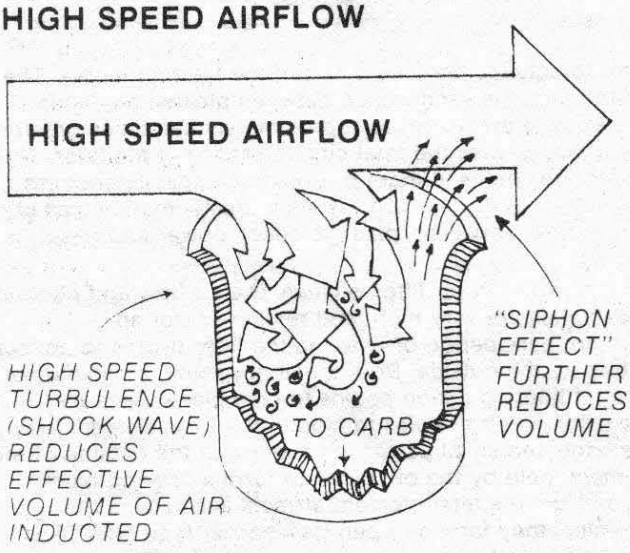
With the benefits of a less restricted air flow, coupled with a high capacity surface area, cleanings may be prolonged as much as 150,000 miles on street driven vehicles! When cleaning the filter is deemed necessary, a very simple method is used. With the use of our specially formulated soap type cleaner, you simply wet the filter with water, roll it through the K & N cleaning solution, let it set for five minutes and hose it off. If additional cleaning is needed, just repeat the process. With our handy squeeze bottle or aerosol oil, re-service the filter by squeezing or spraying on a light film of more oil, yielding a uniform red color.

FILTER SELECTION

If maximum horsepower is the objective, the selection of the correct filter is of paramount importance. Two factors dictate the ability of the air filter unit to flow the maximum amount of air into the engine, these being the shape of the air filter element and its case, and the area of the filtering element. With the K & N filter, we can, because of the free flowing nature of the filtering material and the consistency of manufacture, take the outside dimensions of the air filter as a means of selecting sufficient area for the air flow required. (This is not the case with paper element air filters. The variation in the number of pleats and the inconsistency of the paper material used shows a substantial variation in air flow qualities from manufacturer to manufacturer and from filter to filter produced by the same manufacturer.)

Let us deal with shape first. K & N's air flow bench has shown that with typical two and four barrel automotive carburetors, air filters flow more when their diameter is large in comparison with their height. That means that an air filter 10" diameter X 2" high will generally flow more air than an air filter which is 5" diameter X 4" high. The second thing that the air flow bench has shown, is that whatever rule you make, you will find an exception. If space permits, you should choose an air filter where the height of the air filter is between one-fifth and one-quarter of the air filter's diameter. Remember, this is for a typical two or four barrel application such as would normally be found on a V8.

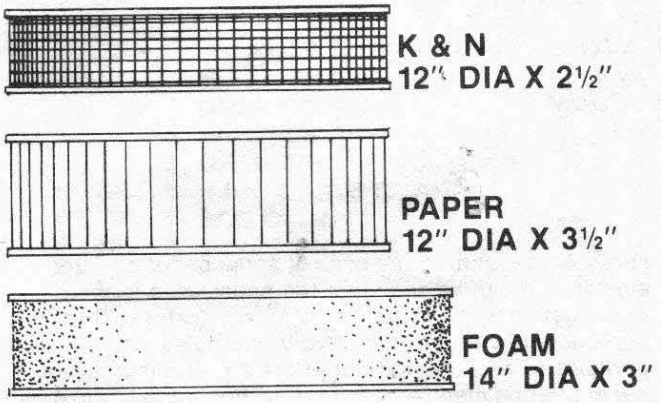
OPEN STACK EXPOSED TO HIGH SPEED AIRFLOW



On single throat carburetors or injector stacks where one air filter per throat is used, a taller air filter can often be used to an advantage. The diameter of the air filter in relation to the throat of the carburetor is important and generally the diameter of the air filter should be at least three times the diameter of the throat of the carburetor. (When available space is the prime factor, however, the air filter may end up requiring a greater length than diameter.)

Once you have determined the shape of filter required, the size of filter must be selected. This is a most important aspect. A filter that is too small will literally strangle an engine. At K & N we believe that 1½" of water pressure drop across the air filter element at full throttle, at maximum power RPM, is the most that should be accepted. This represents an efficiency of 99.63%. (If we were to consider the restriction given by the air filter element alone, the drop in horsepower would only be 0.37% (3/8 of 1%). In practice many of the factors discussed earlier may completely offset this possible small loss in horsepower.) Two factors dictate filter size: the displacement of the engine, and the RPM it turns to develop peak horsepower. If we assume the basic 1½" of water pressure drop is maximum, then a typical K & N air filter will flow 6.03 cubic feet of air per minute per square inch of effective area. (For the best paper element filter, this figure is 4.95 and for the best synthetic foam filter it is 4.38.) The effective area of a filter is the diameter in inches x 3.14 x the height of the air filter in inches, less 0.75 of an inch. The reason we subtract the 0.75 is because of edge effect of the filter. Close to the edges very little air flows, so this part of the filter is not included.

SIZE COMPARISON FOR EQUAL VOLUME AIRFLOW



To determine how much filter area (A) you need, apply the following formula:

$$A = \frac{CID \times RPM}{25{,}500}$$

This equals the effective filtering area (A) required by the filter element.

To find the total height (H) (including the rubber sealing edge) of the filter you need, apply this formula:

$$H = \frac{A}{D \times 3.14} + 0.75$$

In this formula, (D) is the estimated diameter of the filter required, bearing in mind installation clearances. To make things clear, study these two examples:

1. Engine: 350 small block Chevy with an engine specification giving peak horsepower at 6,500 RPM.

$$A = \frac{CID \times RPM}{25{,}500}$$

Applying the formula to determine filtering area, we have:

$$A = \frac{350 \times 6500}{25{,}500} = 89.2 \text{ square inches.}$$

Let us assume a 12" diameter filter is to be used. Then the filter element height will be calculated from the formula:

$$H = \frac{A}{D \times 3.14} + 0.75$$

Putting in the numbers, we have:

$$H = \frac{89.2}{12 \times 3.14} + 0.75 = 3.12"$$

Reference to the K & N size chart shows that a no. E-150 is 3½" tall and would therefore be suitable for this application.

2. Engine: 127 cubic inch (2.1 litre) Volkswagen. Peak power at 5,500 RPM. Application: off-road racing.

$$A = \frac{127 \times 5500}{25{,}500} = 27.4 \text{ square inches.}$$

Say a 10" diameter filter is required, the height needed would be:

$$H = \frac{27.4}{10 \times 3.14} + 0.75 = 1.62"$$

For off-road conditions, make the filter 1½ - 2 times the size. Therefore the filter required will be 2.43 to 3.24 inches tall. An E-110 or an E-112 would be suitable. For long distance off-road racing, two remote mounted air filters would be the most desireable setup.

For a race car of any other sort, an air filter element about the size dictated by the formula will probably do the job. The formula will usually give an odd size for an answer. You should always select the nearest size up.

FLOW BENCH COMPARISON OF EQUIVALENT FILTERS TESTED AT SAME PRESSURE DROP (1½" H_2O)

CLEAN NEW FILTER

BEST PAPER FLOWED 600 C.F.M.

BEST FOAM FLOWED 515 C.F.M.

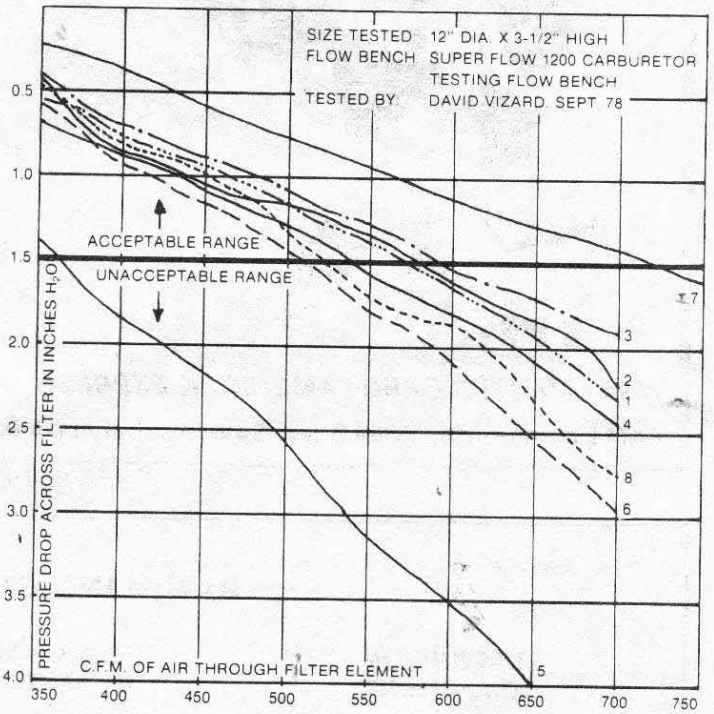
K & N FLOWED 715 C.F.M.

HOW DOES K & N COMPARE WITH THE COMPETITION?

FILTRATION — The ability of a K & N filter to clean the air is a proven fact. Next time you are at an off-road event, just look at the number of our filters installed on competitive and class-winning machines. If you get the opportunity, look inside one of our filters after a gruelling race. Even if you look carefully, the chances are you will see nothing (provided the filter was serviced and the case was sealed properly), and that's the way it should be. Compare that with what you can find inside other more restrictive types of filters.

AIRFLOW — With so much interest in performance, airflow figures are meaningful, not only to the engineer, but also to the racer. The number of CFM a filter will pass depends upon the amount of vacuum used to draw it through the filter element. At K & N we consider 1½" of water as a sensible depression rate to use to measure the CFM rating of our filters. This was decided upon because it is a figure that typically occurs in practice when high performance filters are used. Some filter manufacturers have quoted the CFM of their products using 1½" of mercury as the measuring depression. This is equivalent to 20.3" of water depression. To put it another way, such filters are measured using 13½ times more vacuum to draw the air through the filter, thus giving the impression that the flow is better than it really is. To convert the flow figures of a filter measured on 1½" of mercury to one measured on 1½" of water, divide the CFM by 3.7.

AIR FILTER FLOW TESTS WITH COMPARABLE SIZE ELEMENTS



1. PUROLATOR 3. MOTORCRAFT 5. FRAM (extra life) 7. K & N
2. AC 4. MONTE CARLO 6. FILTRON 8. UNI FILTER

COMPLIMENTS OF POPULAR HOT RODDING MAGAZINE (Oct '79)

If a K & N filter is compared on a CFM basis, it will be found that if a 12" diameter x 3½" high K & N filter flows 715 CFM, then the same size best paper filter will flow 600 CFM and a synthetic foam element 515 CFM. If a comparison is made on a basis of size, a 12" x 2½" K & N flows the same as a 12" x 3½" paper or a 14" x 3" synthetic foam element.

CONCLUSIONS

It is obvious that an unrestricted supply of clean air is vital to engine life and performance.

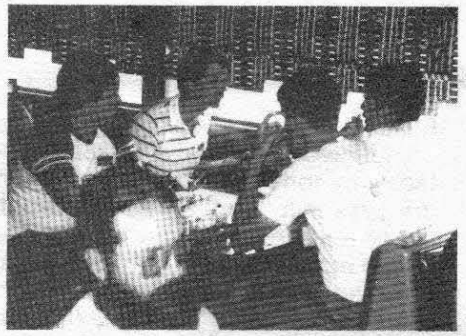
Proper air filtration provides significant advantages in all applications. Our investigations and testing indicate that the K & N filter is the only possible choice, providing all the desireable factors and none of the undesireable ones.

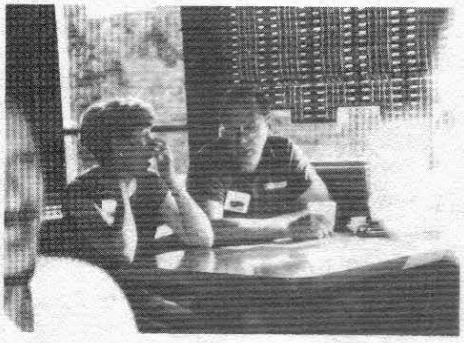
A K & N filter will provide a constant, consistent high volume supply of clean air to your engine for a longer period of time, with a significant increase in horespower, performance, mileage and engine life.

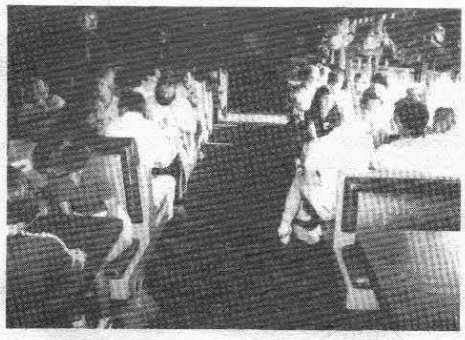
Whether you are racing to win or just driving to work, you can't affort to be without a K & N air filter.

HANDLING CHANGE CHART

SUSPENSION COMPONENT	LESS UNDERSTEER MORE OVERSTEER	MORE UNDERSTEER LESS OVERSTEER
Front Spring Rate	Lighter (smaller dia. torsion bars or spring wire dia.)	Heavier (larger diameter spring wire)
Rear Spring Rate	Heavier (larger dia. torsion bars or spring wire dia.)	Lighter (smaller diameter spring wire)
Front Sway Bar	Lighter or adjust to lengthen arm	Thicker or adjust to shorten arm
Rear Sway Bar	Heavier or adjust to shorten arm	Thinner or adjust to lengthen arm
Weight Distribution	More rearward	More forward
Front Shock Setting	Softer	Harder
Rear Shock Setting	Harder	Softer
Front Wheel Camber	More negative	More positive
Front Tire Width	Larger	Smaller
Rear Tire Width	Smaller	Larger
Front Tire Pressure	Higher	Lower
Rear Tire Pressure	Lower	Higher
Front Track	Wider	Narrower
Rear Track	Narrower	Wider







HOLIDAY GREETINGS

CONTACT PATCH

con't from page 14

The contact patch is perhaps the single most significant aspect of a tire's function. Simply defined, the contact patch is the area of the tire which is in contact with the road surface at any given moment. (Figure 23.1) It is also ***the only*** part of the ***car*** that is in contact with the road surface.

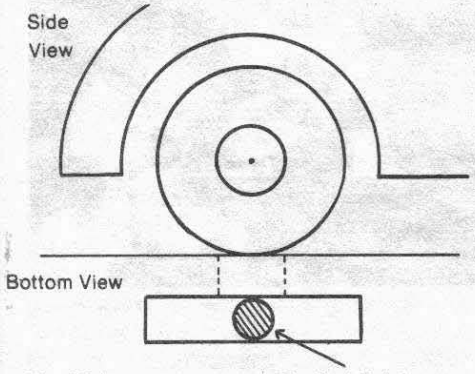


Fig. 23.1

Essentially, the contact patches of a car's four tires determine how well or if that car will stay on the road. For this reason, every aspect of tire design and construction is aimed directly or indirectly at influencing the contact patch's shape, size, efficiency and behavior under driving conditions.

Size of the contact patch is, of course, primarily determined by the size of the tire (overall diameter and cross section width). Contact patch shape is principally affected by the tire's aspect ratio. (Figure 23.2)

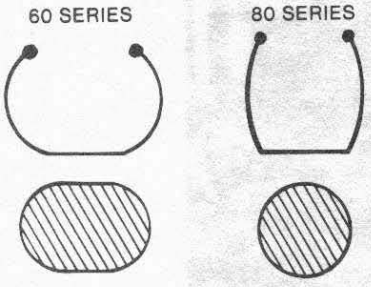


Fig. 23.2

Efficiency of the contact patch refers to how well it adheres to road surface's in conditions under which the tire was intended to be operated. Major features here are tread compounding along with tread design selected and the ratio of "rubber to void" (or blocks to groves) utilized in the tread design. (See Figure 23.3)

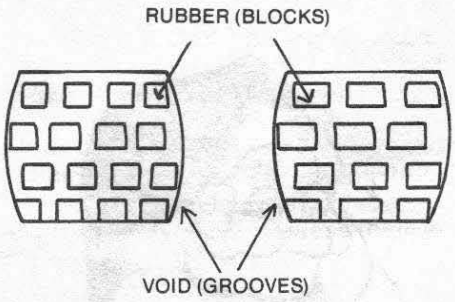
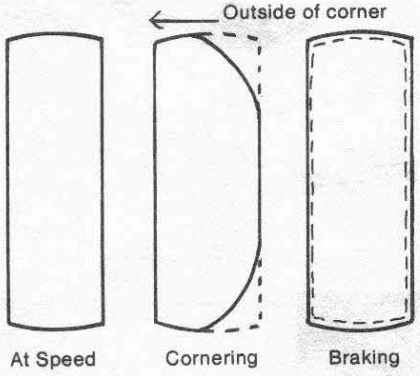


Fig. 23.3



How the contact patch behaves under driving conditions is a function of all of the above. During driving, the contact patch will typically change it's shape during the acts of cornering, braking and increasing speed. (See Figure 23.4) A carefully designed tire will provide consistent and predictable behavior of the contact patch during all phases of the tire's operation.

The Pirelli patented 0° nylon cap belt is an excellent example of a tire construction feature which has a direct effect on the behavior of the contact patch. As a tire's speed increases, centrifugal force causes the center of a tire to bow outward as the sidewalls draw in. (See Figure 23.5) This has the effect of shrinking the contact patch which leads to decreased stability and predictability.

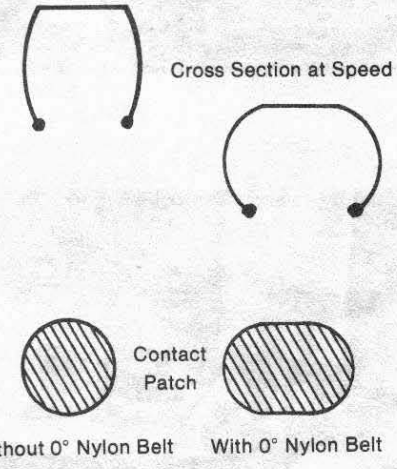


Fig. 23.5

By running a)° belt (or belts) of nylon around the circumference of a tire, "bowing" of the tire at speed is effectively reduced providing a more consistant and stable tread patch throughout the speed range. The end result being a more stable, predictable car throughout the speed range.

The breakfast of champions!

Advancing trend toward four-valve engines

An increasing number of European auto firms are moving into four-valve car engines for increased output and torque flexibility from a small displacement. For high-performance upmarket cars the gains are felt to outweigh the extra production cost, due to doubling the number of cylinder head parts and added machining requirements.

Four small valves give larger port areas for better breathing and cylinder-filling than two large ones, thus improving volumetric efficiency. Thermal efficiency is at the same time improved by the possibility of a compact, pentroof combustion chamber shape with low surface-to-volume ratio. The spark plug can then be centrally positioned, shortening flame travel and reducing burn time.

This permits a higher compression ratio that benefits both power output and economy. Freer breathing allows the use of milder valve timing and less overlap for a given specific output, and this cuts exhaust emissions. The consequently smaller requirements for controlling emissions could then partially offset the added cost of the more complex valve arrangement.

Four valves date back to 1912 when they were first used in a Peugeot racer. Since then and until recently they have generally appeared only on competition engines because of the cost factor. Meanwhile, however, other race- and rally-bred concepts like disc brakes, overhead camshafts, turbocharging and aerodynamic aids have been adopted for production cars by high-volume auto makers.

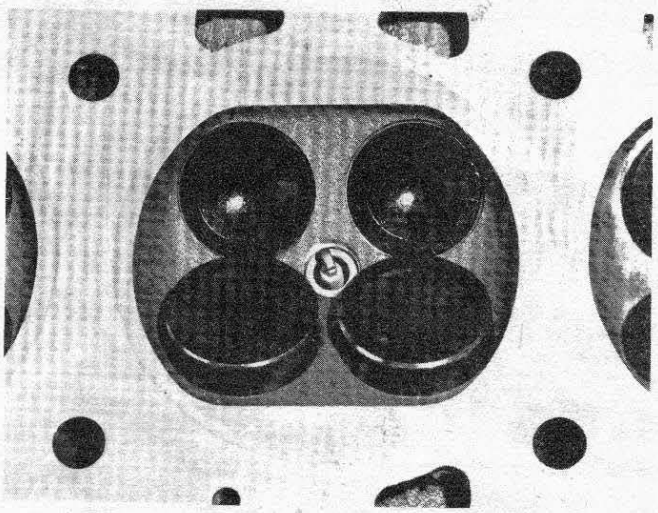
Multi-valve engines could follow. While the present European trend in this direction is as yet concentrated on the upper end of the market, it could gradually move down the scale if cost-effectiveness of the construction can be established.

Jaguar, a company with a strong racing heritage, has launched a four-valve injection engine for its latest XJS coupe and cabriolet, and which will replace the ageing XK in the forthcoming XJ40 sedan. It is unique among the current batch in being an entirely new in-line six-cylinder unit designed from scratch specifically for such a valve layout. Designated AJ6, this displaces 3.6 L with 91-mm bore and 92-mm stroke, and with only modest tuning develops 168 kW (225 hp) at 5300 rpm. Maximum torque is 325 N·m (240 lb·ft) at 4000.

Paired inlet and exhaust valves with single springs are angled at 24° and 22.5° respectively from the vertical, forming a pentroof combustion chamber with a central plug. Domed pistons give a 9.6:1 compression ratio.

Twin camshafts operate the valves directly via bucket-type tappets. They are driven by a chain rather than a more fashionable belt, since the latter would require large-diameter pulleys on the shaft noses. Because of the wide cylinder head these would add to the critical installed height of the engine, even though it is tilted to 15° in the car. The need for very accurate timing also favored a chain.

Drive from the crankshaft is by a two-stage duplex chain, with the primary loop engaging an auxiliary shaft idler sprocket alongside the intermediate one. This offset shaft drives the distributor, steering pump, and air emission pump (for U.S. cars). A further simplex chain below drives the oil pump.



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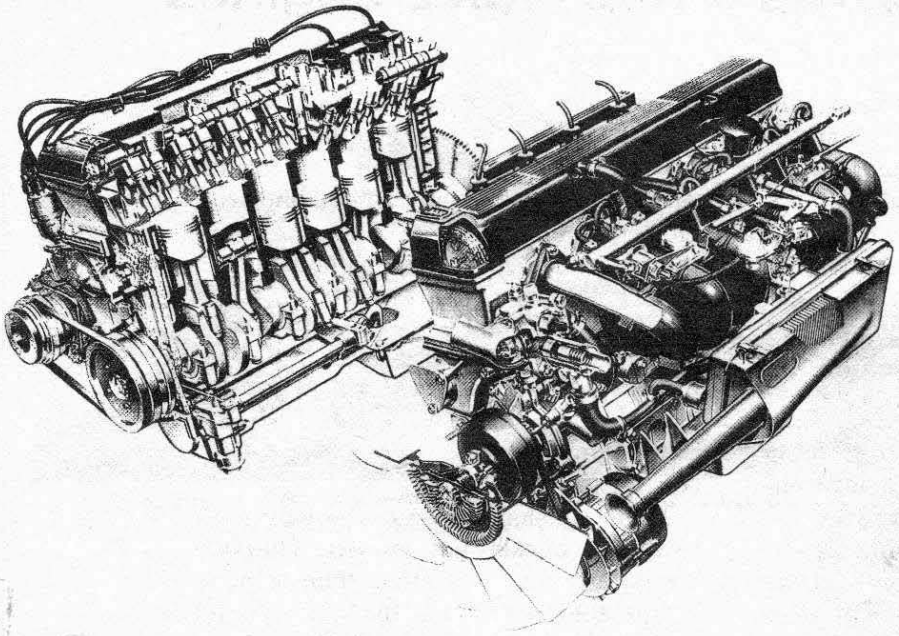


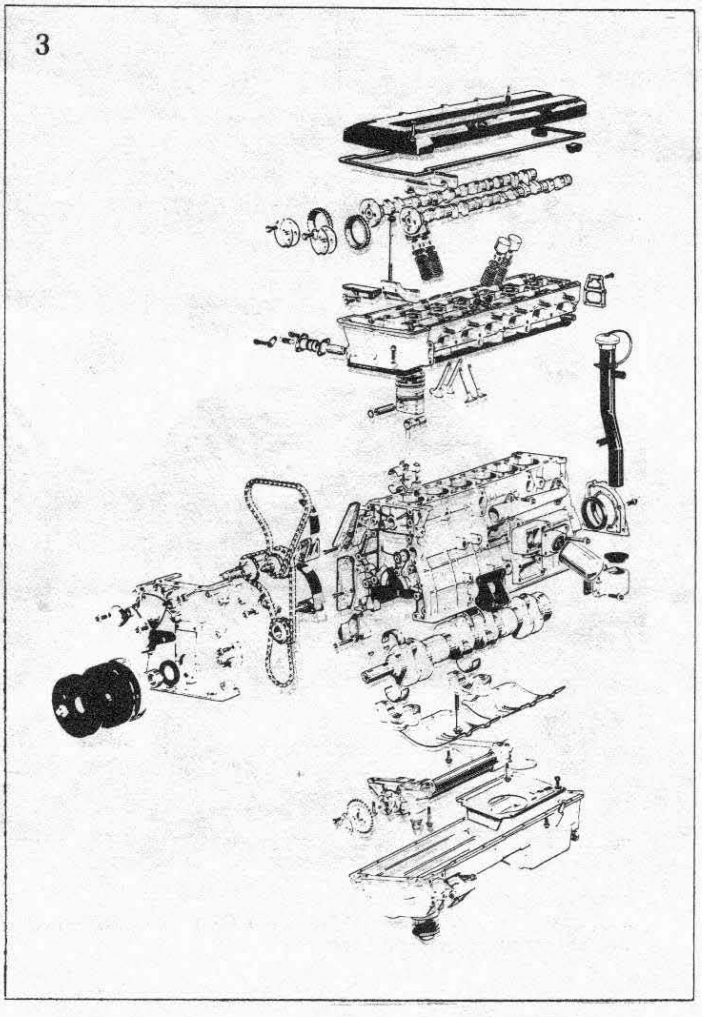
1. Jaguar's pentroof combustion chamber is defined by straight sides, has spark plug in dead center.

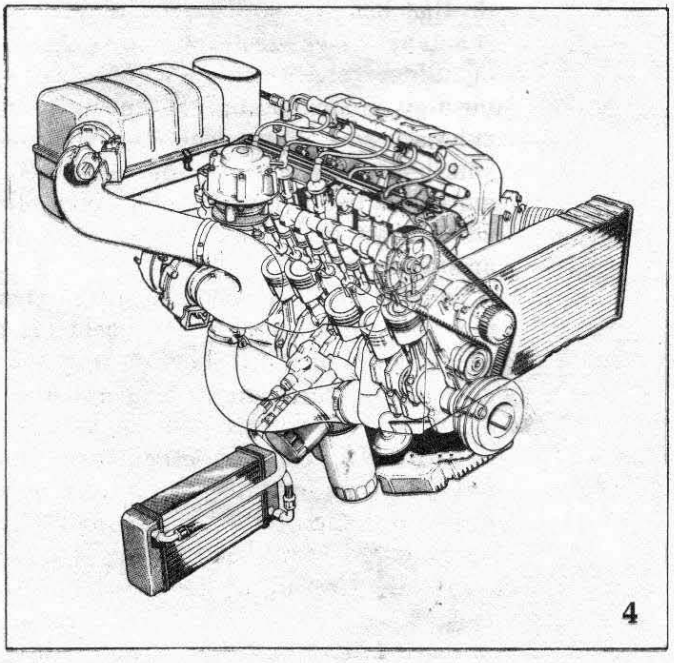
2. Cutaway view of Jaguar AJ6 engine shows broad cylinder head, with wide-angled valve operated by twin chain-driven camshafts. Output of 3.6-L unit is 168 kW (225 hp) at 5300 rpm.

3. Exploded view of AJ6. Two-stage duplex chain drives camshafts, with intermediate idler sprocket on auxiliary shaft for distributor, steering pump, and air emission pump where fitted. Simplex chain loop below drives oil pump.

4. Five-cylinder 2.10L engine for Audi Quattro Sport puts out a massive 220 kW (300 hp) with turbocharging and intercooler. Upright exhaust valves are paired with inlets at a 25° tilt, giving a compact combustion chamber.

2





Four-valve engines

Both the cylinder head and block are aluminum alloy gravity die-castings. These help cut the weight of the AJ6 to 195 kg, 22% below that of the Jaguar XK engine in 4.2 L form, which has a lower output of 153 kW (205 hp). The block is of open-deck design with shrink-fit dry liners rather than wet ones, which also saves weight as well as improving torsional rigidity.

For this production operation the entire block is progressively heated in a two-stage infra-red oven, when the liners can be fitted by hand into the expanded bores. It then immediately enters a special cooling tower where chilling is rigidly controlled. Valve seats and guides are inserted in the head by a similar process.

Fuel injection is by the Lucas Bosch P-Type digital system. A six-branch inlet manifold has long, 43-cm tracts providing a useful ram effect to boost mid-range torque. These mate with oval entry faces for the siamesed inlet ports, where the injectors are angled for a direct spray. Future plans for an economy version of the engine call for an alternate two-valve cylinder head with May Fireball combustion chambers as featured on the Jaguar V-12.

Germany leads the four-valve vanguard in numbers as well as in sheer horsepower. Audi has adapted its 2.1-L five-cylinder engine to deliver no less than 220 kW (300 hp) at 6500 rpm for the Quattro Sport, a shortened version of the company's 4×4 road car. This remarkable output is 50% more than from the two-valve turbo unit, and in rally trim it could be raised to around 335 kW (450 hp).

The cross-flow light-alloy cylinder head is of course entirely new, and the valves are set at a narrow angle that Audi favors for allowing a more compact combustion chamber shape. They are located asymmetrically, with the exhaust valves dead upright, parallel to the cylinder bores, and the inlets tilted at 25°. With this configuration the main chamber volume is directly beneath the exhausts, while the head can be narrower and hence lighter.

In addition the two camshafts can be closely spaced, and thus geared together to simplify the timing drive. A toothed belt drives a cog on the exhaust shaft, with a pair of slim helical gears behind coupling it to the counter-rotating inlet shaft. There is a double-flow induction system that equalizes the quantities of air and injected fuel reaching each cylinder. The manifold is a single alloy casting incorporating a water gallery that is connected to the cylinder head.

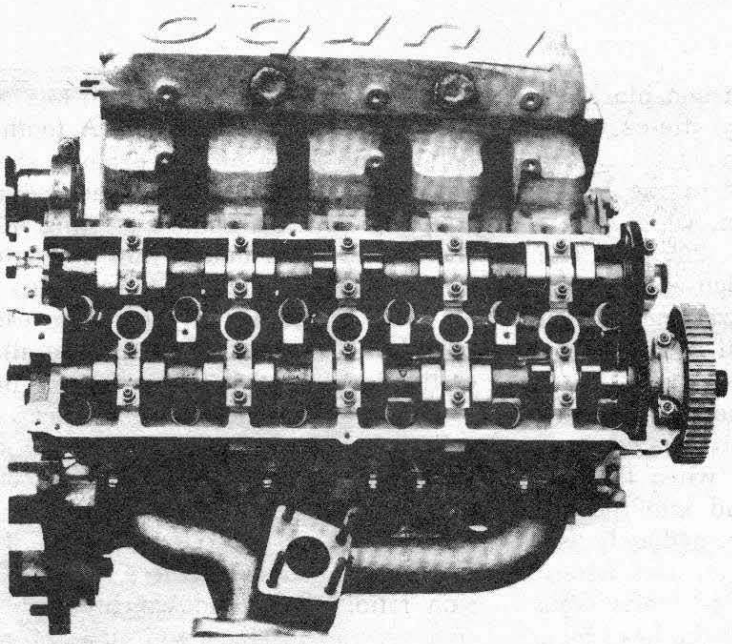
Easy breathing allows taking full advantage of turbocharging with intercooling. Both these units are larger than in the basic Quattro, giving 220 kPa (32 psi) boost pressure, with 8.1 compression ratio. The added weight of these components, together with that of the head, is compensated for by an aluminum cylinder block, used for the first time by Audi. It is unusual in being cast directly around thin-walled iron liners, and is 25 kg lighter than the equivalent five-cylinder cast-iron block.

Volkswagen opted for a similar four-valve layout in a muscular version of its 1.8-L engine for the hot Scirocco 16V. Inlet valves are angled at the same 25° from the vertical exhausts, and there is toothed-belt drive to the exhaust camshaft.

One difference is the position of the helical gears on the tails of the two camshafts. This minimizes the length of the cylinder head, and makes it interchangeable with the standard one for the engine in this transverse front-drive installation. The narrow twin-cam head also facilitated such replacement, as it allowed identical locations for the stud and bolt holes.

Hydraulic bucket tappets, used for the first time on a sporty production engine, are another difference. These maintain valve clearances without periodic adjustment, and eliminate noise from that source. To meet the increased oil supply necessitated by 16 tappets there is an oil pump adapted from the small VW diesel that has 15% greater output than the standard one for this engine. This is operated by a belt-driven layshaft via skew gearing.

Exhaust valves are sodium-filled and inlet heads are hardened to withstand the higher combustion temperatures



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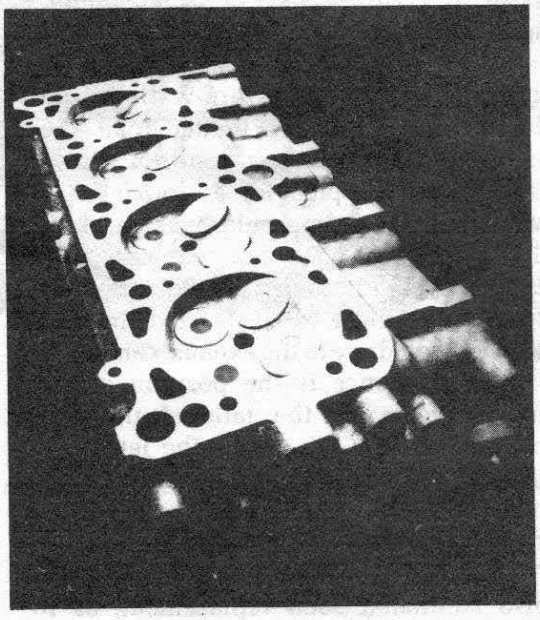

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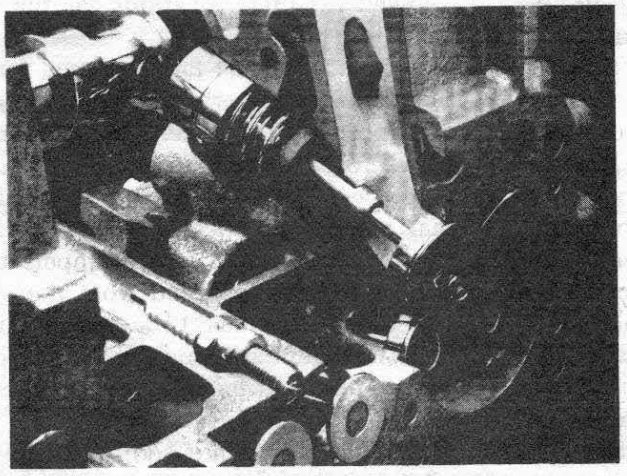
5. Closely-spaced camshafts on Audi cylinder head are coupled by slim helical gears, with exhaust driven by a toothed belt. Inlet manifold casting behind it includes water gallery.

6. VW head for Scirocco 16V 1.8-L engine has semi-pentroof combustion chamber, with vertical exhaust valves and angled inlets. Belt-driven camshafts counter-rotate, with coupling gears on their tail ends.

7. Close-up of VW combustion chamber shows details of valve layout. Hydraulic tappets are used for the first time on a production high-performance engine.

8. Four-valve head for Mercedes 190E 2.3-16 is produced by Cosworth in Britain. Output of 136 kW (185 hp) at 6000 rpm is 36% above standard engine.



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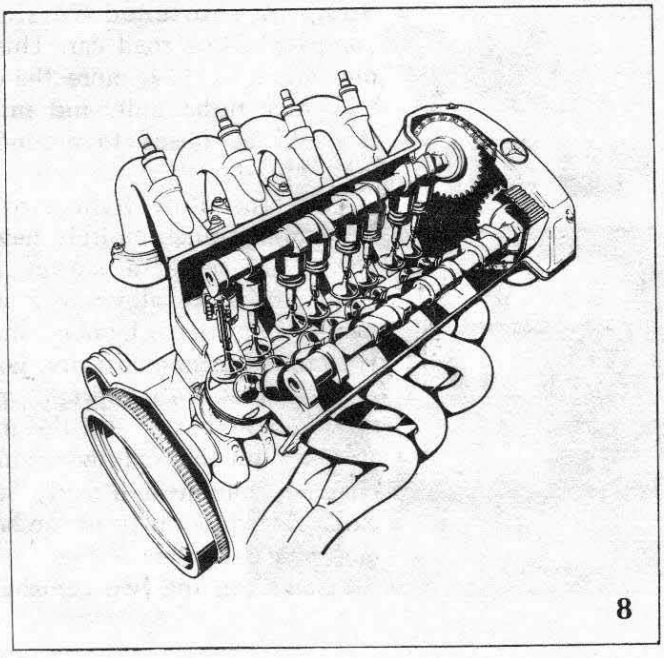

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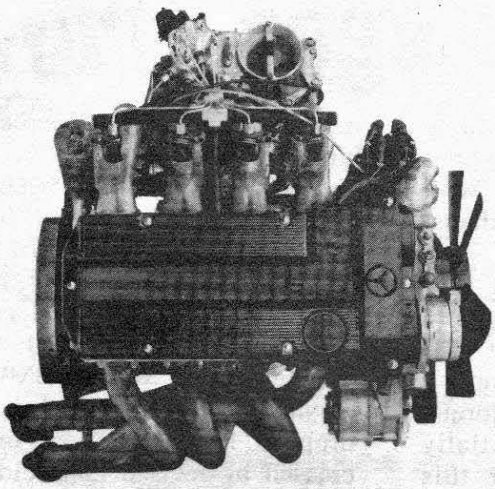

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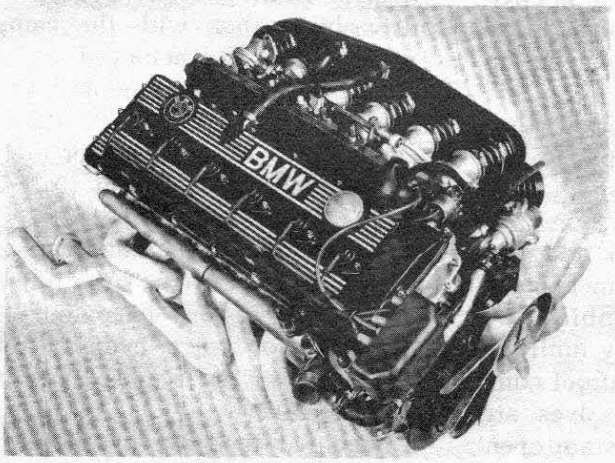
9. Mercedes 2.3-L engine has complex induction system, with plenum chamber feeding air through individual ram pipes that split to mate with twin inlet ports. Two-part exhaust manifold handles paired cylinders with each section.

10. Power unit for BMW M 635CSi coupe is adapted from mid-engined M1 road racer. Twin camshafts are driven by simple roller chain.

11. BMW 3.5-L engine in 24-valve form produces 210 kW (286 hp) at 6500 rpm. Ignition and fuel injection are controlled by Bosch electronic management system.

12. Saab engine with 16 valves, the company's third-generation 2-L turbo, will be in full production by mid-1980s. Without intercooler as pictured it develops 118 kW (160 hp).



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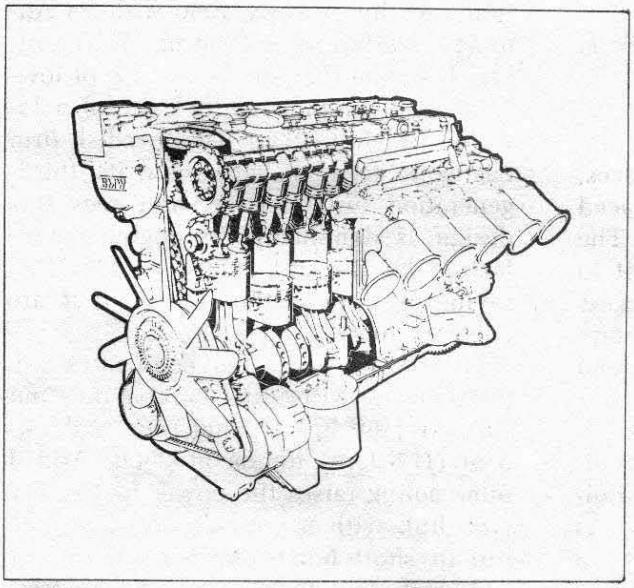

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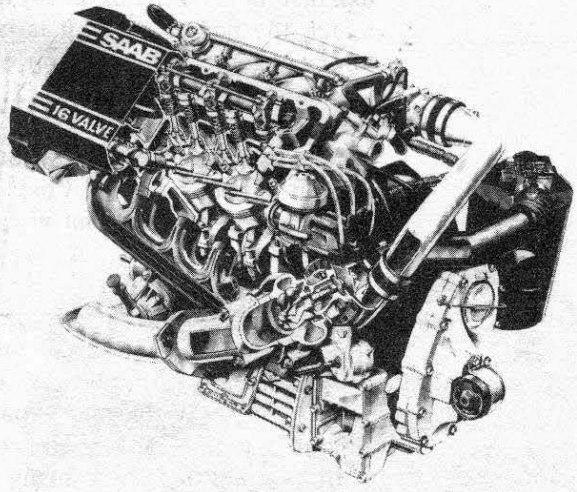


12

Four-valve engines

resulting from improved cylinder filling. There is a new crankshaft with wider journals, longer conrods together with shorter pistons, and a larger exhaust manifold with twin outlet pipes.

The 16V injection engine with 10:1 compression ratio produces 139 hp (102 kW) at 6300 rpm, which is some 20% more than the Scirocco GTi unit across the entire rev range. Maximum torque of 160 N·m at 4500 is substantially higher. The weight penalty for this added performance is 35 kg.

Daimler-Benz went to Cosworth Engineering in Britain for the design of the 16-valve head for the 2.3-L engine in the newish small Mercedes, designated 190E 2.3-16 in this high-performance model. Output is raised by 36% to 136 kW (185 hp) at 6000 rpm, and torque by 17% to 240 N·m at 4500. Compression ratio is 10.5:1. The block and bottom end of the engine are unchanged.

The cylinder head resembles the Jaguar's in having mutually-inclined valves at a 45° angle, and pentroof combustion chambers. Exhaust valves are sodium-cooled. Bucket tappets are operated by widely-spaced twin camshafts with simple roller chain drive.

Inlet air from a plenum chamber is fed through four ram pipes to the crossflow head, where there are individual ports for each valve. The pipes are bifurcated to mate with the joint faces, and the angled fuel injectors are placed just ahead of the division points. The exhaust manifold has a similar split to match the paired ports. It is in two parts joined together. One section of steel piping handles cylinders Nos. 1 and 4, and the other 2 and 3.

The cylinder heads are produced in Britain by the patented Cosworth aluminum casting process that virtually eliminates microporosity. A sand mold is filled with hot metal from below by a special pump, when air is displaced from the cavity. Accuracy comparable to die-casting is obtained by using sand with a very low thermal expansion coefficient for the molds and cores, with both bonded by cold-curing resin.

Cosworth is at present making the finished head, although Mercedes will in future take on part of the machining. Planned production is 5000 a year.

While Mercedes applied the four-valve treatment to the smallest car in its range, rival BMW went the other way to create the 635 M CSi as its flagship coupe. This is powered by the 3453-cc straight-six developed for the BMW M1 mid-engined road racer, which has now been dropped. Performance was marginally increased by revised manifolding, and by the application of the Bosch Motronic digital management system. Better driveability than with the competition version was also achieved.

The engine now produces a massive 210 kW (286 hp) at 6500 rpm, which comes to 61 kW (82 hp) per liter. Maximum torque is 340 N·m (250 lb·ft) at 4500. The wide-angled valve layout closely resembles the Mercedes, with the twin camshafts driven by a roller chain. Flat-topped pistons have four recessed crescents for valve head clearance at TDC, and giving a raised compression ratio of 10.5:1.

Saab led the way in 1976 with the first turbocharged production car, and followed this in early 1980 with its Automatic Performance Control (APC) anti-knock system that allows the use of low-octane gas without risk of harmful detonation (AE July 1980). The Swedish firm has gone to four valves for its third-generation turbo engine, and sees this design as dominating its engine manufacture by the mid-1980s. A 10% fuel saving as well as increased output are cited as the big advantages.

In 16-valve form the company's 2-L turbo engine with turbocharging puts out 118 kW (160 hp) at 5500 rpm, and 240 N·m (177 lb·ft) torque at 3000. Added intercooling raises the power to 132 kW (180 hp), with a possible 150 kW (200 hp) in short bursts for overtaking.

A high (for turbocharging) compression ratio of 8.5:1 contributes to this performance. This is made possible by the APC system which monitors and controls boost pressure, and maintains it at the maximum possible level relative to the octane rating of the fuel.

Four-valve engines

which can vary from 92 to 98.

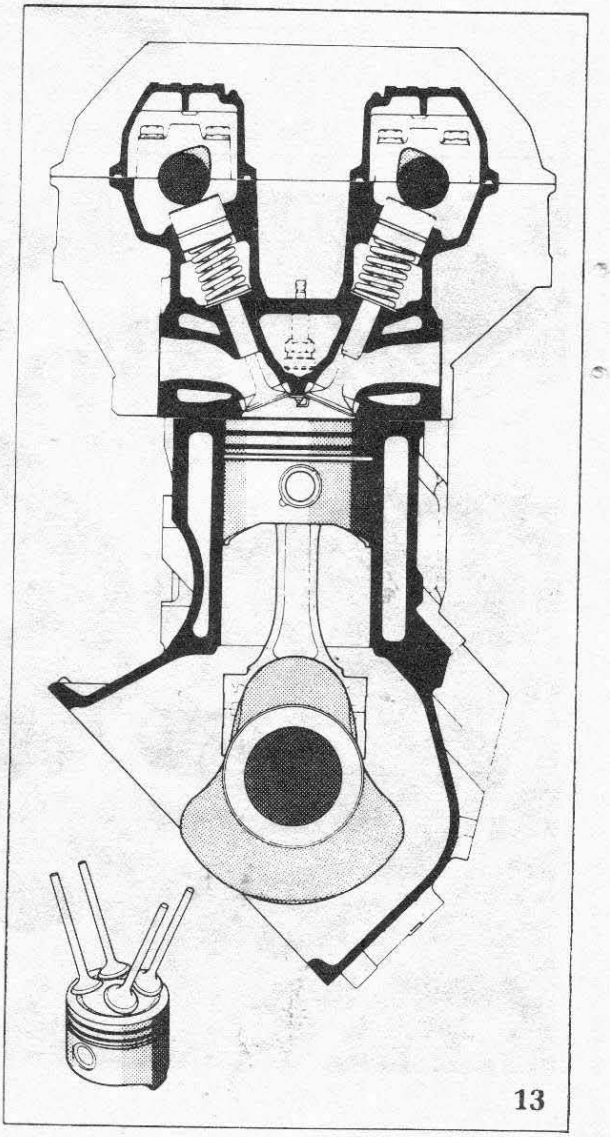
Valves are symmetrically inclined above the central spark plug at an included angle of 45°. They are operated by hydraulic lifters to reduce maintenance requirements. The engine is equipped with Bosch LH electronic fuel injection for improved economy and easy cold and hot starting, and which is self-adjusting for atmospheric pressure changes at different altitudes. Anticipating volume production, Saab has fitted the unit to a prototype 900 convertible described on another page.

Volvo is also in the running with a four-valve edition of its 2.3-L B23 engine, which normally develops 83 kW (112 hp) at 5000 rpm with a single carburetor. With the new head having a 38° symmetrical valve spread and twin carburetors the output is more than doubled to 170 kW (230 hp) at 7200. However this is as yet only a competition machine.

Extensive modifications to the bottom end include low-weight crankshaft and conrods, forged pistons with narrow rings, and different manifolding. A tamer version could be expected in production. While no plans for this have been announced, it is a safe assumption that Volvo is keeping a close eye on the rival Saab effort.

Another competition engine with a possible commercial future is a turbocharged unit from Peugeot that develops an exotic 240 kW (320 hp) at 8000 rpm from only 1775 cc. Intended for a 4×4 rally car, it is a 71-year update on the French company's four-valve pioneering.

This modern version with fuel injection is based on the PSA Group's XU light-alloy wet-liner block used in the Peugeot 305 and Talbot Horizon diesel, but with special forged pistons, conrods, and crankshaft. Valves set at the orthodox 45° are operated by belt-driven twin camshafts lying at the edges of the broad alloy cylinder head. Compression ratio is 8:1, with the compressor delivering up to 170 kPa (25 psi) boost pressure.



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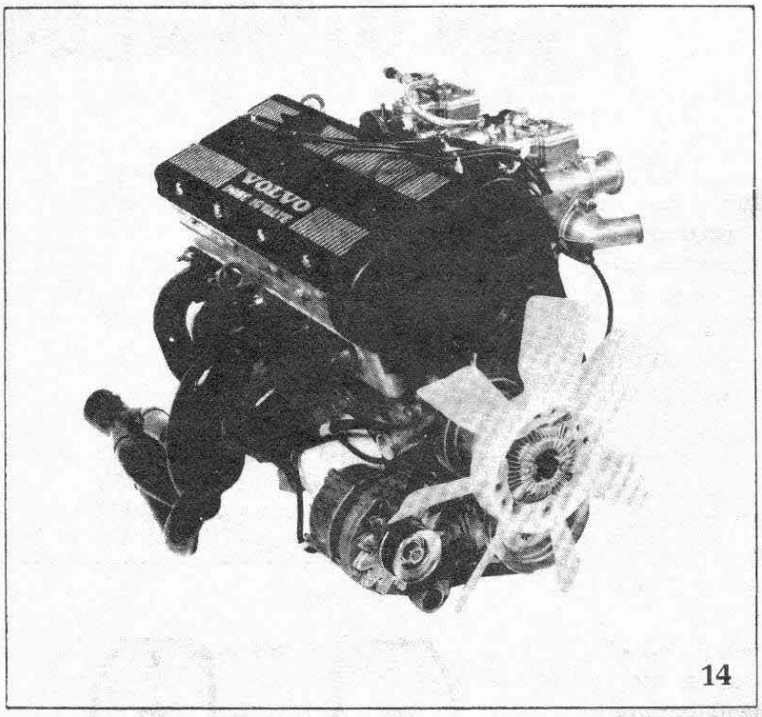

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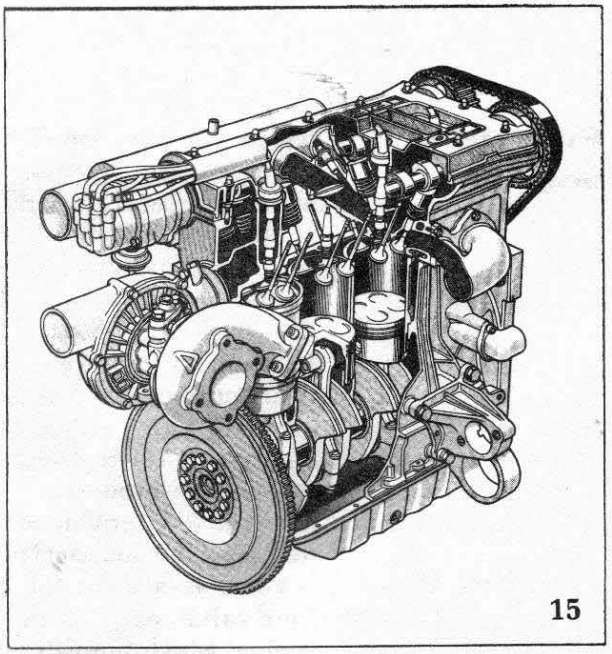

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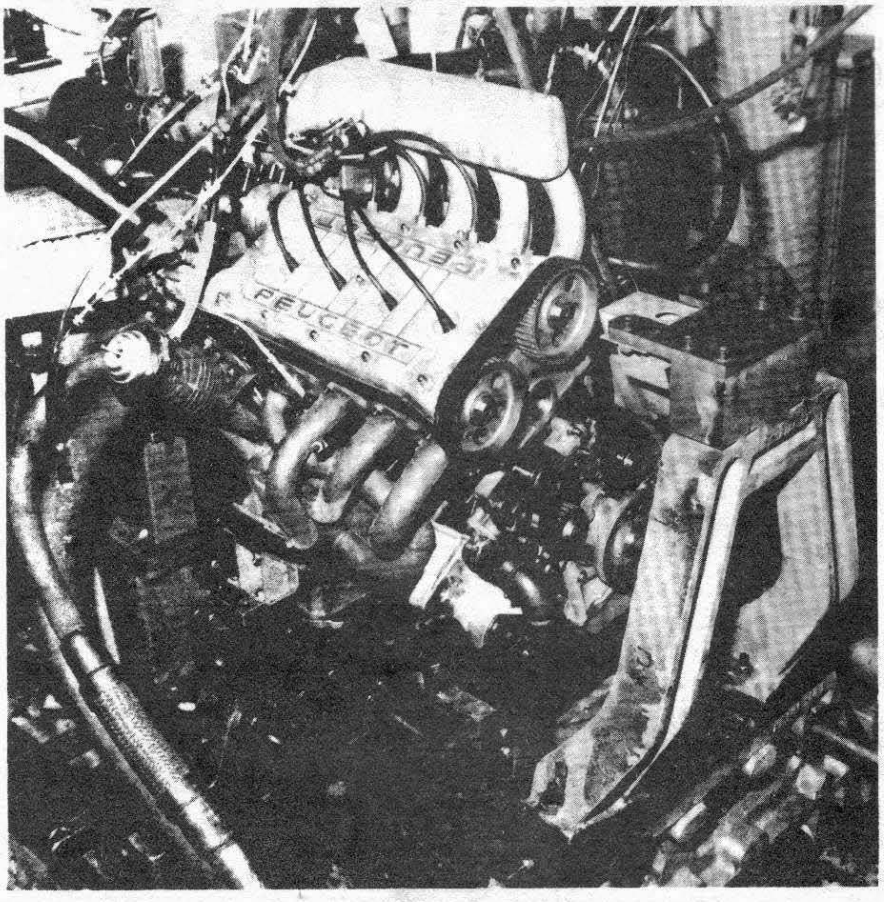

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13. Valve layout of Saab 2-L engine. Hydraulic tappets eliminate need for periodic clearance adjustment.

14. Volvo DOHC 16 Valve is so far intended only for competition, though volume production may follow. With 2.3-L displacement it puts out 170 kW (230 hp) at 7200 rpm.

15. Peugeot XU9T with intercooler (not shown) delivers 240 kW (320 hp) from 1775 cc. The four-valve competition engine is based on a production cylinder block, but with special mechanical parts.

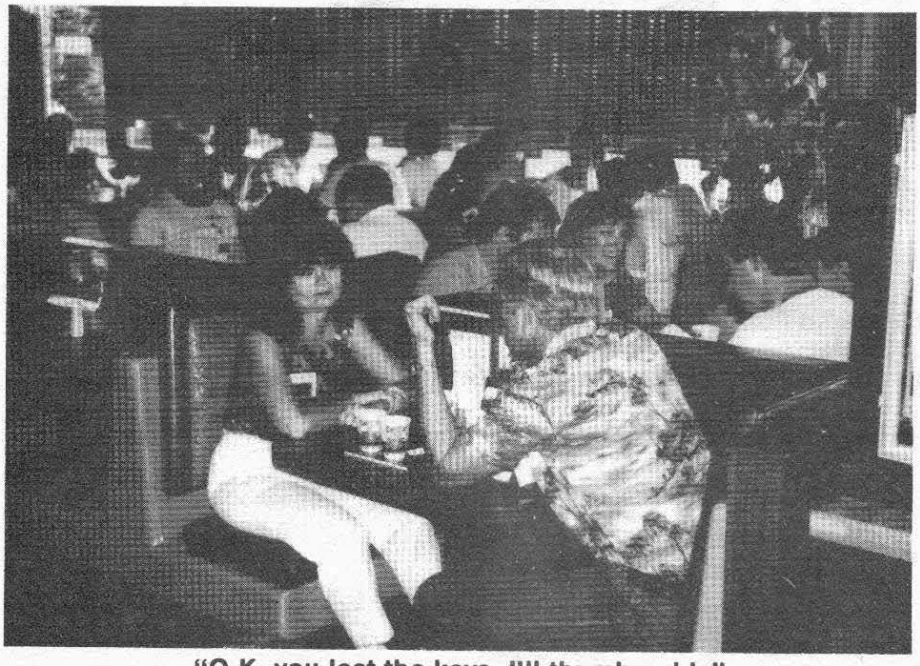
16. All-alloy Peugeot engine on test bed. It is transversely mounted in the rear of a 4×4 rally car.

Thanks to Jim Bartuska for this story

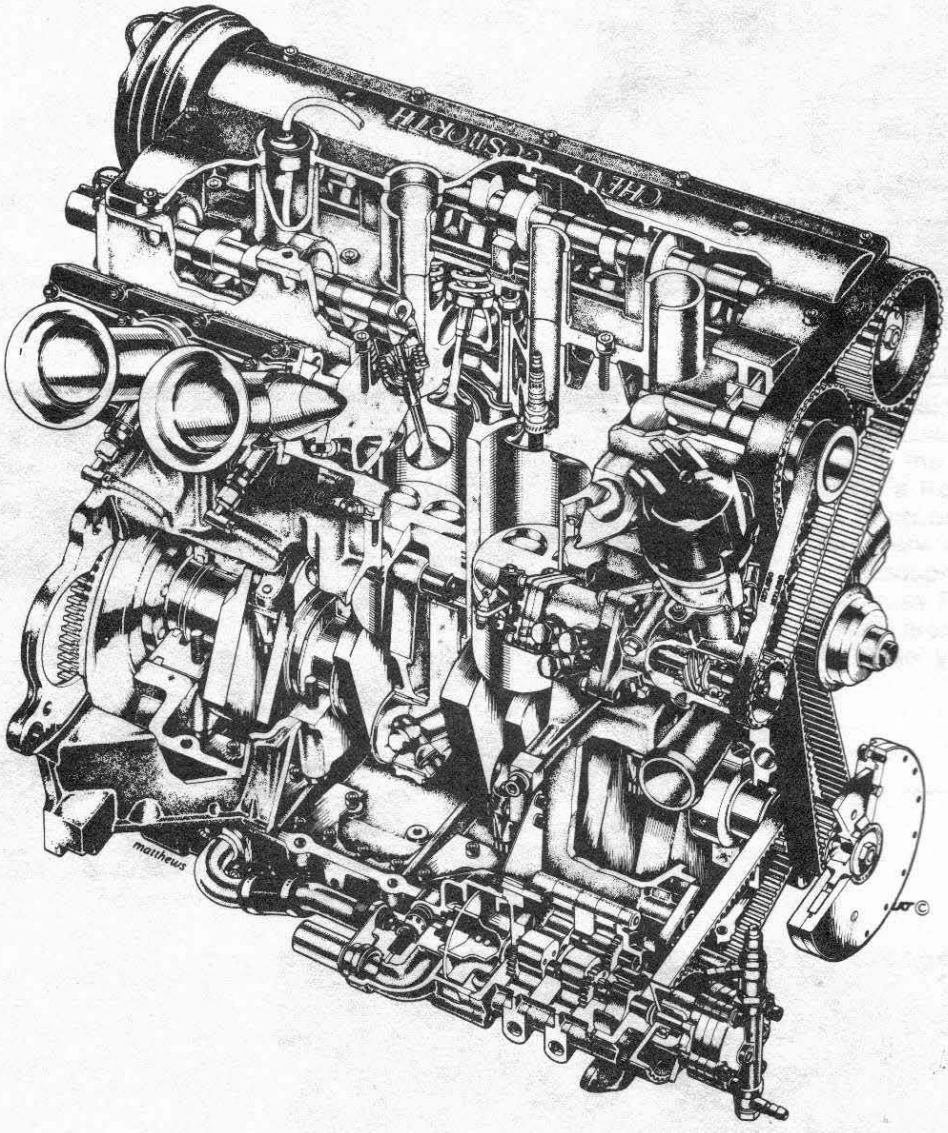
George Harrington and Jim Hall

Clark Kirby | Mystery Woman | Bob Chin | Shirley Rust

Mike Garland | Arthur Crittenden



"O.K. you lost the keys, I'll thumb a ride"



Cosworth of England Formula II EAA engine based on Chevrolet Vega aluminum block.
This is the "grandfather" of all Cosworth Vegas

Photo Courtesy of Bill Hutton and MOTOR Magazine

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