



VEE LINE

NUMBER 17

FEBRUARY 1966

DIRECTOR'S CORNER

This is it. I had one written, but something had to be left out, and it seemed the logical choice. *don*

YOU CAN STILL SELL GOLD BRICKS

Someone certainly sold someone something in regard to valve spring shimming, which we voted down almost two-to-one. In the first place, it is *not* a standard VW practice, as described in "Sports Car" for December; and in the second place, because of that fact there is no "standard dimension". (Note that the "dimension" is omitted in the GCR.) The only reference to a spring dimension in VW literature is in the procedure for valve spring *testing*. A spring compressed to a certain length (varies from 1.31" to 1.35" in different publications) should require roughly 96 lb. \pm 7 lb. (again the figures vary slightly) for such compression. In the third place, there are no standard VW shims for this purpose. In other words, spring shimming is legal, period, apparently-- what tech inspector is going to be able to determine that your shims are too thick?

While we're on the subject, non-stock VW bearings (which were not on the list we recommended) as specified in the GCR, could be a blessing in disguise for Formula Vee. You don't think so?

Okay, so you happen to know that some people are "blueprinting" engines, using undersize bearings on the crankshaft to allow for regrinding. In case you *don't* know about "blueprinting", it's the process of going entirely through an engine, using the manufacturer's "blueprint" as a guide, and taking advantage of all the permitted tolerances in order to make the engine as nearly perfect as possible. The GCR, for instance, allows a .005" tolerance in the stroke, so a crank would be reground to include that extra length by grinding a little more off the con-rod journals on one side than on the other. If it is determined that the throws aren't *exactly* opposite each other, this, too, is corrected during the regrinding. An obvious result is that all the journals will be undersize.

Now here's the catch: The GCR states that non-stock con-rod and main bearings the "same type and size as *standard* VW" may be used. If this is interpreted officially as it reads, this would preclude the use of reground shafts, and eliminate a good deal of this "blueprinting". As mentioned elsewhere here, with a little persuasion, you can get a brand new crank for not much over \$30.00, which isn't much more than the price of a re-

ONE MORE TIME

John Proctor (who wrote the thesis mentioned in the December issue) called the other morning, for clarification on the cylinder size permitted. This has been explained a number of times, but still seems to be a bit of a problem. Even his local VW dealer could not figure it out. So we'll have one more go at it, with a chart taken from the VW Workshop Manual. You might take it with you when you go shopping, just in case.

	Colour	Cylinder mm \varnothing	Corresponding Piston mm \varnothing
Standard Size Nominal Dimension 77 mm \varnothing Plus .008" for wear (.203mm) 3.040"	Blue	76.990 - 76.999	1192cc 76.95
	Pink	77.000 - 77.009	76.96
	Green	77.010 - 77.020	76.97
1st Oversize Nominal Dimension 77.5 mm \varnothing	Blue	77.490 - 77.499	77.45
	Pink	77.500 - 77.509	77.46
	Green	77.510 - 77.520	77.47
2nd Oversize Nominal Dimension 78 mm \varnothing Plus .008" for wear 3.080" (as shown in the GCR)	Blue	77.990 - 77.999	77.95
	Pink	78.000 - 78.009	77.96
	Green	78.010 - 78.020	77.97

This will perhaps clarify what we've been saying about the "1192cc" being in error, too. The actual maximum now allowed is 1199.

The question has been raised, "Why show an allowance for wear? The cylinder will still show the original size at the top and bottom, even if it is worn in the center, where the rings bear." This is true, in standard VW practice, but in racing practice, as was mentioned by John Boyles in his question about oil last month, some mechanics, when "preparing" an engine for racing, "drastically increase the clearances." In the cylinder this is, of course, done by honing, and you can't be selective about this, even if you would want to. You hone, as evenly as possible, the entire length of the barrel. And you'd better not go the full .008, if you're going to do it--leave a little for wear. That "3.040" is *maximum*, no matter how you got it, or where it's measured.

While we're on the subject, the specified clearance for new pistons and cylinders is from .0014 to .0021 (roughly 1½ to 2 thousandths, if you're not familiar with this kind of figures). If I were getting a new set I'd ask for the "green" cylinders and "blue" pistons, which would give better than another half-mil (thousandth).

grind, and certainly wouldn't hurt Formula Vee as much--looking at the overall picture--as will the feeling that if you can't afford a \$500 "preparation" job, you might as well give up.

The actual benefit from "blueprinting" is hard to determine, but in the case of the VW, which is pretty well built, anyhow, it probably wouldn't be very spectacular. On the other hand, if there is a Class where just a little bit helps, it is certainly Formula Vee. And aside from direct benefit, as mentioned above, the psychological effect on those who can't afford it--or who don't want to get involved in that type of "racing"--is bound to be detrimental if the impression becomes widespread that you can't hope to race in Formula Vee unless you follow suit.

Let's work on this--"The GCR says you have to use "standard" bearings--no undersizes." The throws and first three main bearings are 2.164" on a new crank, in case anyone should ask you.

ERRORS

I was in error last month in stating that the error in front suspension serial number would be corrected before the GCR was issued. I see it's still there, too. That makes three, then--the cylinder bore, the serial number for the front end, and the displacement. The cylinder bore figure is being corrected--I note it was carried by Competition Press in the last issue--but apparently the others aren't considered important.

"Whit's Vee Clinic" will be in operation at the Savannah Driver's School, March 12 & 13. FVI members only, but don't worry--Whit will have application blanks handy.

SIGNS OF THE TIMES

This is skimmed off the top of a whole page devoted to the subject in "Open Wheels" (the publication of the Northern California Chapter of FRA). It's not official policy--in fact it was written anonymously--but the fact that it appeared at all is significant.

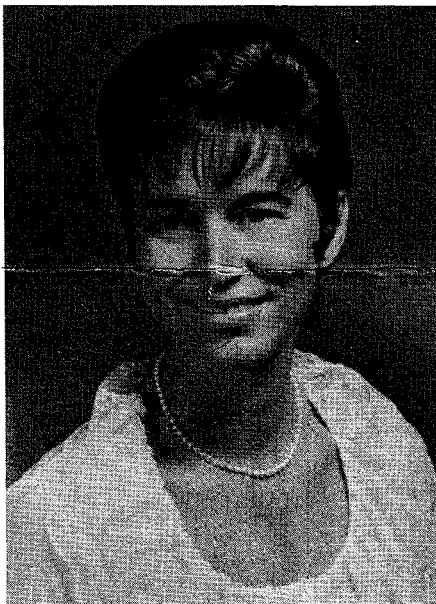
"If formula road racing is to ever become stabilized and to flourish in the U. S. it will be because of the existence and growth of Formula Vee. If this country is to ever have a true professional circuit of well matched and closely contested grand prix formula events it will be because of the presence of the Vee Formula, a class which is too lightly held in many quarters.

"There are only three factors: first, cost; second, availability; third, fun. They add up to the largest body of open-wheel single seat racing machinery built to rigid, formulized specifications existing in this country and they are here now.

"Furthermore, these are the only sizeable group of formula cars which can and consistently do put on a *real contest*. If given an event restricted to Vees alone, with properly informed announcement, the spectator response will be most positive.

"Once Formula Vee has become the backbone of open-wheel events...there will evolve *team* sponsorship of more expensive machines, still rigidly formulized...of sufficient numbers to make up a real program of *closely matched* and *professionally driven* grand prix cars..."

There's a lot more along the same line, but you get the idea.



You've met our new President, and our new Executive Secretary--here's our new Vice President, Violet Hendrickson, of Winter Park, Florida. She was unofficial secretary of this outfit way back when, and is now secretary to the Competition Board, and Race Secretary in her Region. She was in charge of Registration at the Daytona ARRC recently. She shares a Vee with her husband, Dave, and is going for a National license this season.

THE VEE AND ME

Whit Tharin

This is the first of what I hope will be a not too irregular series of topical discussions of Vees, Vee people and me. To begin the series, let's discuss how to make your Formula Vee more competitive.

There are undoubtedly many tricks, methods and/or theories which are better than mine, but these have served to make my early Formcar a front-runner for three seasons. I have not used all these items for all of that time, since many were developed or borrowed as the various problems they solve came up. Indeed, if any Vee had been so set up in the beginning it would have easily won any event entered in 1963 or '64, and most of '65. Lap times (including a few records) I set in 1964 were lowered 4 to 6 seconds in early '65, and it was 2 to 3 seconds faster than that by the end of the season. I have, however, registered few wins: 3 in 8 starts in '64, and 2 in 12 starts in '65. The point? Formula Vee is not a stagnant class, as some have maintained. Constant improvement is necessary if you mean to be a front runner. No one yet knows the ultimate set-up. Better ways are continually being developed. Now let's discuss some of the things that have made mine go.

The suspension--

The suspension is probably the most important single aspect of preparing a good Vee. If you can't get it around a corner, no amount of engine work (legal type) will win for you. No matter how well you drive, neither you nor Stirling Moss can take it around a corner any faster than the limit of adhesion, and that limit is inherent to your suspension set-up. So let's look at it.

All standard kits now being sold are vastly improved over the early models of the first three kit makers, but all can be further improved by the individual driver to suit his own style. You must experiment and seek a set-up that works *with* you, not against you, and responds to your particular instincts and reactions. You can set up for oversteer, understeer, neutral, or a modicum of all three under varying impetus.

In arriving at my present set-up, the primary goal was maximum speed in moderate to high-speed corners. This is most easily achieved by avoidance of oversteer, or rear-wheel breakaway. Hanging the rear end out is a lot of fun, but it is a very momentum-robbing method of getting the car around a corner. I don't object to all four wheels sliding a bit, but a hung-out rear end will be slower any time you are past the apex. On the other hand, the car should not be so addicted to "rails" that it can't be easily controlled in a slide, or even "pitched" into a corner occasionally. It is rare that the ideal line can be followed in every corner, every lap of a race, so the ability of your suspension to keep you in command on less than the ideal line, and when dicing and dodging, is of tremendous importance.

My secondary goal was to compensate for my own driving inadequacies, so some of this may be wasted on consistent, alert drivers who seldom make mistakes that must be corrected in the vicinity of the apex after late-braking somebody at 9½/10ths of maximum. In short, I believe my suspension to be "spin-proof" in the hands of any driver with average reactions and anything other than lead in his seat. Much of what I have in my old Formcar applies to most Vees, so here goes....

My front end is from a 1962 sedan, top torsion bar removed and replaced with the standard Formcar swaybar, but I left the standard VW sway bar on it, too. It looks like the 1966 GCR means to say that my double sway bar set-up has to go. I can't imagine why--it doesn't cost anything extra to leave the VW bar on it, and it will cost me to beef up the inadequate one that runs through the torsion bar tube, but Don had a good "How To Do It"--in an old Bulletin, so I guess I'll just have to dig it out. (Numbers 4 and 5, Whit. don)

The whole front end is mounted so that the lower tube is 3/8" to 1/2" ahead of the upper one. This is to get the "caster", which does two things--it reduces wander on the straights, and makes the tires "lean in" at the top when they are turned into a corner. Set properly, the "lean in" will compensate for front end "give", and result in a vertical wheel. This places the tire in good, flat contact with the road surface under hard cornering (See the April, 1965, Bulletin for Don's "How To" #7.)

Other minor items--use ball bearings for reduced friction, and use a light bearing grease such as "Bosche", "Coppercoat" or some moly-type grease. Adjust and pack for each race. Front wheel brakes are standard VW, 1962.

One important item often overlooked is the location of the pitman arm. The steering gear box should be rotated on the torsion bar so that the tie-rods are level with the ground, with the driver in the car. With this achieved, the toe-in should be set at 1/4". Movement of the front end will be mostly down, but either way will then result in a decrease of toe-in. This won't hurt you as long as it doesn't go to toe-out. The object of this is to ensure toe-in under most cornering conditions, where a brief spate of toe-out can be very worrisome indeed. When the steering box is properly located, weld keeper bars to the tube on each side.

My rear suspension has two primary features--a lot of easily adjusted negative camber and extra-long trailing arms. There are other minor items, but let's look at the two main ones first.

I run what appears to most people to be an excessive amount of negative camber. True, it saps power at the universals, but it works in the corners. For old Formcars and any others using large coil springs, the adjustment feature can be added in five

minutes. Four worm-gear hose clamps, two on opposite sides of each spring, are attached so that the top 5 coils can be drawn together. This yields an easy and infinite adjustment of camber. You can "tune" the suspension for every course with just a screwdriver. You can even set either wheel for more or less camber on courses where the tough turns are predominately left or right. Most new kits have built-in camber adjustment, but few give you enough, even at maximum settings.

My trailing arms are 32" long now, but the originals were less than 20". I believe any trailing arm less than 26" can be improved by lengthening it. How you do it depends on what kit you have. I made new ones from Schedule 80 (extra heavy) 3/8" black pipe, and used 1953 Ford tie-rod ends with a counter-threaded female adjusting sleeve. The tie-rod ends bolt through the fiberglass to new mounting points on the frame, right in the cockpit.

I am still using the original equipment type of coil-shock unit (Monroe LL56), but sure do wish the shock were adjustable. I would like to be able to progressively compensate for wear, since the shocks are "excellent" for only two or three races, after which they get weaker and "worse". I try to get 8 to 10 races out of them because I simply can't afford new ones for every other race. *(In fairness to Monroe, Whit mentioned that he tows the car on an unsprung trailer, with the suspension free, so the shocks actually get a good many miles of wear between races, too. don)*

Among the miscellaneous items are camber-limiting straps. Many others have devised ingenious systems of cables and pulleys that result in an interaction of forces between the rear wheels. With my set-up I don't need that, but for safety's sake I do have individual cables. They limit downward travel to "O" camber, and are purely to keep the wheels from folding under in case of a spin-out, which was the intended purpose of the original ruling which permitted them. I never did think that cables and pulleys were legitimate under the 1965 rules. 1966 rules, however, invite experimentation in this area, and I intend to do some.

This is as good a place as any to discuss tires. I used Goodyear R-2's since they were first available, and may go to whatever they bring out this Spring when the present tires are worn out. Tire pressures are critical on R-2's--I have seen a small change make a big difference. The final pressure selected will depend on many things, as everybody knows, but mine vary from 20 to 27 on the front and from 24 to 32 on the rear. I usually begin with the highest pressures and reduce in two-pound increments until handling gets worse, then add air back to the last good pressure and reduce again in one-pound shots. If it rains, add 12 to 15 pounds. Suspension adjustments are made in about the same manner.

Tire sizes are dictated to me by the length of the straights. In general, I run as small a tire as possible on the front and as large as I can pull on the back. This usually means, for me, 4.50-15's on the front and either 5.00 or 5.50 on the rear. I run a stock 1962 sedan transaxle and have never changed a gear in it. Tire size is my only "gear change". I have never been able to pull a 5.90 or 6.00 satisfactorily, but if I could I would probably go up to 5.00 on the front, too. I know a lot of experts will disagree with this, but none of them can outcorner my Vee on standard VW wheels.

The place to do all this suspension and tire adjustment for the first time is at a Driver's School, or with private time on a course. Don't go sauntering off to a National with a screwdriver in one hand and a tire gauge in the other. Once you have it set, the variations from course to course are relatively small, if you keep good records. Then when the big races come around you'll have time to work them down to a fine point.

(Next--Engine set-up)

DOWN UNDER

One reason for the rapid rise of Formula Vee in Australia is that it has had good support from the top, right from the start. The Australian Automobile Racing Club acquired two Vees, for the use of its members. On one "practice day" they were driven about 150 laps apiece, by 18 different Club members, with nothing but enthusiasm. A couple of members are selected to drive them in races as Club entries.

A letter from Geoff Sykes, their Secretary, mentions that on January 19 they already had eleven Vee entries for their February 13 International Meet at Warwick Farms.

**The VEE LINE of
Formula Vee International**
Don Cheesman, Director
Box 291
Ephrata, Washington 98823

IT'S A LONG DISTANCE TO WESTPORT

Operator? Long Distance, please... thank you.

Long Distance?...I want to speak to Mr. Westport please...But I don't know his other names...Well, he runs a racing outfit called SCCA...Sorry, ma'am, I don't know where...No ma'am, it probably wouldn't be at Daytona--that's a French outfit...Indianwhat? Ain't that in Detroit's backyard?...Well, I don't know either, but the outfit I want races them foreign cars--you know, little red and blue buggers without no tops hardly...Yes, ma'am, like a MGB...You got one?...Well, I'll be! How you like it?...That's fine...Your boy friend has been wanting to what in it?...Well, that's what I'm talking about...Yes, ma'am, the same outfit--S-C-C-A...In Connecticut?

Well, see if they got a Mr. Westport, because he's got one thing a little mixed up in the Formula Vee rules and I got to tell him about it so he can fix it up... Well, he goofed on the cylinder size... I don't know, but I guess somebody slipped him a wrong dimension somewhere...Well, because he's got it 20 mils too big in the book...I say so... Because I know it...Well, I know it because I know what we voted for...Our owners' and drivers' association, that's who...Formula Vee International...Yes, ma'am, and 86% of us voted for the size Mr. Westport got 20 mils too big.

Why sure, he meant to do the right thing...No, ma'am, I don't think it could be anything but a mistake...Well, there was some other stuff, since you mention it...Well, he put in valve shimming and 63% of us voted against that...No, ma'am, he don't have to do what us drivers want...Now, come on, ma'am, you don't expect me to believe the Democrats got anything to do with this...Oh, not that kind of politics...Well, he did put in dual brakes, just like we voted for--98%--and he made the big oil pump and a temp bulb in the crankcase all legal... Yes, ma'am, there was some things we voted for that he didn't put in, too... Oh, not many...Well, let me see--there was use of the transporter clutch that we voted for 95%, relocating tie rod ends, 100%, coil shock units as the only springs, 99%, a one-inch minimum space between air ducts and the engine, 88%, modified distributor advance mechanism, 86%, and use of oil filters, 61%.

Yes, ma'am, that's more than I thought...I don't know--I ain't counted them... Well, if you add the "didn't do's" we voted for to the "did do's" we voted against, I reckon it would be maybe 8 or 10 things...Oh, there was plenty of things he did that we wanted...Well, I told you most of them...How many? Well, I guess at least 4, maybe even 5, depending on how you look at it...You would think what?...Well, I don't see how you can say that...No, ma'am, I sure don't. Mr. Westport has got a reputation for not making mistakes, except for a few honest ones.

Well, he just might be a mite smarter than we are. Yes, ma'am, I guess I mean he just might know more about Formula Vee than we do, being all that close to all those other classes... Well, he knows what turned out best for them so he should know how to look out for us... Well, them others are supposed to be a little different from us...Just different... Well, you see, we drive real race cars and them other classes just got a lot of cars like they drive on the highway... That's right, ma'am, just like your MGB, some of them... Well, I think you'd like to see one too... How about the one at Bainbridge next weekend?... Fine... No, ma'am, never mind Mr. Westport. He's probably too busy, anyway... Yes, ma'am, see you Saturday.

By Frank V. Dryver

(No, ma'am, I can't take the credit for this one. don)

BALANCING

You can get all kinds of opinions on the benefits of balancing. Either it has but little effect on power, or else it's the most important step in tuning, depending on where you get your information. Those of you who were with us last April probably remember the article by Pete Reidy, who works in a balancing shop in California, and whose approach to the subject is probably as unbiased and scientifically based as any you'll find.

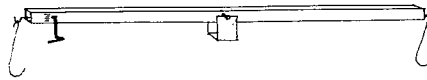
He said, you'll remember, that a factory built VW engine won't be benefitted much by balancing, but if parts have been replaced, flywheel lightened, or crankshaft reground, balancing is indicated. He also said that the main benefit was in reducing vibration, and, therefore, stress on parts--that the power increase would be a maximum of .15 (fifteen hundredths) of one horsepower.

So you've replaced some parts, and are wondering what to do about balancing. Well, VW allows a variation of 5 grams in both pistons and rods in new engines, and allows 10 grams for repair jobs, if that helps any. Most shops have the scales with which to determine these weights, and you might be able to get them to check out your parts. On the other hand, you can do it yourself; and if you have the time and patience, you can get the variation down to a fraction of a gram.

We're talking here about pistons and rods only. The flywheel and clutch we'll take up in a couple of later issues, and we'll dispose of the crankshaft right now. If your shaft is in original condition, it probably won't be benefitted much by balancing; but if you think it would help, get it done professionally. It's strictly a "dynamic balancing" job, done while rotating it at high speed. Even if you could detect unbalance by placing it on parallel bars and finding one side a bit heavier, you wouldn't know which end to do the lightening on, and could actually increase the vibration by guessing the

wrong end. If your crank needs regrinding, it should probably be balanced, too; but when you consider that the price of a new crank is under \$40.00, less whatever discount you can talk your dealer into--well, take your choice.

So let's balance the pistons and rods. All you'll need are a coarse half-round file, a small bench grinder, and a delicate balance scale. You can buy such a scale for only a few hundred dollars, or you can build one yourself for only a few cents. Don't laugh--the one described here will detect the weight of the *filter* on a cigarette (whole cigarette weighs about one gram). We're not concerned with *how much* a piston weighs--only whether it's more or less than another one.



The principal ingredient is a stick of wood an inch or so square (or round) and three or four feet long (the longer the more accuracy). Drive a nail in each end and bend into a hook, with the lowest point *below* the center line of the stick. Carefully measure from the *low points* on the hooks and find the center of the stick (don't try to do it by balancing). Drive two more nails at the center for pivots, slightly *above* the center line. Bend a piece of sheet metal into a square "U", as shown, and file the top edges smooth. Make two large hooks from identical lengths of heavy wire and your scale is complete. Set it on the table so the wire hooks can hang over the sides and balance it by laying nails on the light end. When you have the right number in the right places drive them into the stick. Make a marker of wire and a few marks for a scale, so you can tell when it's level in use, and you're in business.

Find the lightest piston and then file from the edges of the skirts on the rest till they are all the same weight. There is some excess metal in the area of the

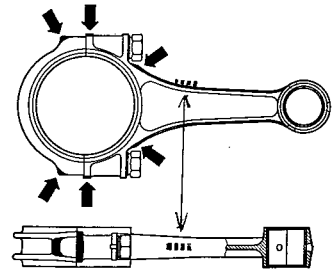
wrist-pin boss which won't be missed, but don't file into the boss itself. When you think you have one equal to the lightest one, switch ends on the scale and try again to see if you get the same result. Then repeat with the others.

Follow the same procedure with the con rods, grinding only in the areas shown. A professional shop will also balance each rod to determine which end to grind, but the VW rods are so nearly identical at the wrist-pin end that any deviation will be negligible. A couple of special notes regarding the rods--

1. If you are replacing one or more rods, balancing them is definitely needed. New ones are furnished overweight just for that purpose. If you don't want to do it yourself, at least have your VW dealer get them within acceptable limits with his equipment.

2. Along about 1963, for some undisclosed reason, offset con rods were introduced. The wrist pin end is 1-mm out of line with the con rod end. You can check it with a straight-edge. If your rods have a small forging projection on one side (as indicated in the drawing) that side should be UP in the installed engine.

The amount of improvement due to balancing will depend, of course, on the amount of imbalance previously present and the degree of accuracy in your work, but you should be able to tell at least the difference in vibration in your mirrors. Don't expect a comparable increase in power, though--from that standpoint it may be a disappointment.



**Formula Vee
International**

BOX 291
EPHRATA,
WASH. 98823