



VEE LINE

NUMBER 51

DECEMBER 1968

DAYTONA INTERNATIONAL VEE RACE JAN. 31

DIRECTOR'S CORNER

When this thing was new—when the “Bulletin” was addressed by hand, and I knew all the members by name, at least—there was time for personal correspondence, and nearly every message could be answered. I’m very gratified by the constant growth of this organization, of course, but there is one negative aspect—the personal relationship seems to diminish in direct proportion. There’s no longer time to reply to every letter, nor room for all of them in the VeeLine. I hope, then, that all of you who have sent Holiday Greetings and other personal notes throughout the year, and those who have sent pictures of their cars, races, etc., and who haven’t received any other acknowledgement, will accept this as my reply: Thanks so very much for your support and encouragement. I only wish I could tell each of you personally how much I appreciate it!

I don’t know just when you will get this, but with the Holidays and all, it’s bound to be even later than usual, so don’t get excited while you’re waiting. If everything goes as planned the ‘69 rules will be included with it, which will perhaps make the wait worth while.

LIKE IT OR NOT, WE’RE STUCK WITH IT!

If I appear to be bitter about this exhaust thing, it’s only because I am. Not about having to rebuild our exhaust system—that may be rather interesting—but because it is being forced upon us against most of our wishes. If they had been approved, even by just a bare majority, I’d have gone along peacefully—but they weren’t. They are being rammed down our throats in wilful disregard of our expressed opinion, and I’m being dragged along kicking and screaming. I’ll recover, no doubt, but right now I wouldn’t bet that there will even be a ballot next year if its conclusions are going to be so thoroughly ignored.

Well, nothing is going to change now except 2000 exhaust systems, so we might as well accept the inevitable and get on with the business at hand. So what are we going to do about it?

If we had a Zink or an Autodynamics or a Bobsy or a Beach, or anything else with an active “factory,” I’d write, phone or telegraph them and find out what *they* are going to do about it. Chances are that you’ll be able to buy, if you can afford it, an exhaust system tailored to your car, scientifically designed, and perfected on a dyno. Considering, however, that the going price for mass produced and marketed special exhaust systems for Volkswagens is around \$50, a hand-made, low volume item like this will probably run as much as twice that amount.

If, like us, you have an orphan Formcar, or a Sardini or a Shark or a “special,” and you live two hundred miles from the nearest dyno and don’t have the time or money for that kind of research anyhow, you may want to follow our faltering footsteps. We’re going to get the best available information, an armful of plumbing, and a rabbit’s foot, and dive in. (“Any backyard mechanic can put an exhaust system together with ten dollars worth of tubing and bends.”) This is strictly not guaranteed to be the ultimate in exhaust systems—your car may just set there and huff and puff and backfire and blow smoke rings when you’re through—so follow us at your own risk!

“Tuning,” as applied to exhaust systems, is just exactly what it says, as compared with “tuning” an engine, which isn’t really. We won’t go into a lot of theory and formulas here, but you really should have some idea of what you’re doing, and why.

To start at the beginning, what we’re trying to do is extract the last traces of exhaust gas from the cylinder at the end of the exhaust stroke, and, if possible, give the incoming fuel charge a preliminary nudge. The piston, of course, comes to a dead stop at top dead center, and moves very slowly through several degrees of crankshaft rotation on both sides of that point. The crank, however, and the cam and valve train don’t even slow down, so that while the piston is practically stationary, the exhaust valve finishes its cycle and the intake valve opens appreciably. To keep the valves open as far as possible during the piston’s effective stroke, the exhaust valve doesn’t entirely close until after the crank has passed top dead center; and the intake valve starts to open while the piston is still moving upward on its exhaust stroke. Both valves, then, are partly open at the same time, while the piston movement is such that it really has but little effect. This is described as “valve overlap.”

It is commonly assumed that the more overlap a cam provides, the more power the engine will put out, but this depends on a lot of other factors as well. For instance, it’s fairly obvious that if the intake valve starts to open while there is still exhaust pressure in the cylinder, some exhaust gas will exit into the intake passages, and will then be sucked back into the cylinder when the actual intake stroke begins. Likewise, exhaust gas will be drawn back from the exhaust manifold if that valve stays open too long after the intake stroke begins. The slower the engine speed, the more likely this is to occur. “Overlap,” then, can’t be evaluated without also taking engine speed into consideration, along with intake and exhaust manifold length.

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CARS FROM A DOZEN NATIONS TO RACE

No, there will not be a big Vee event in the Bahamas this year—or in the future, as far as is known now. However, there will be one in that vicinity which will be almost as big, and in many respects, better. As a social event, carnival or vacation trip, it won’t hold a candle to Red Crise’s spectaculars; but from a racing standpoint, this one is going to be pure pro—no curbs, no inept corner workers, no rule changes in mid-stream and no special preparation required. (1969 Vee rules apply.) The prize money is still more lavish—\$7,250 for first place—and even the tenth-place driver will get his entry fee returned. From there on back, in the 250-mile main event, everyone gets \$100, and even those who get dumped in the three scheduled elimination heats will receive \$50. The \$150 entry fee includes a double motel room for five nights (Jan. 28 through Feb. 2) and two paddock passes to the “24 Hours of Daytona,” which, coincidentally, happens to be scheduled for the same place on the same weekend.

If you haven’t received entry forms yet, write—or better, call:

Roger Bear, Race Secretary
Daytona International Speedway
Daytona Beach, Fla. 32015
(904) 255-6581

And now let’s all observe a minute of silence for the Bahamas Speed Weeks.

“WHAT DO ALL THOSE LITTLE MARKS ON A PISTON MEAN?”

Our President, Harriet Gittings, set this off, although it has been answered privately several times before. Evidently it is not too uncommon to find VW personnel who can’t answer it, so next time you go piston shopping, slip this in your pocket—you may be able to make a big impression on your parts man with your knowledge of VW hieroglyphics.

If you have No. 17 VeeLine, a look at the chart may help, but if not, come along anyhow. First, there are three *sizes* of cylinders and pistons—“standard,” “first oversize” and “second oversize.” New engines have the “standard” size, and most of the cylinders and pistons sold individually are the same. Factory rebuilt engines will have re-bored “oversize” cylinders, and your parts department may have a couple on hand for use in these engines. The “standard” size, of course, is the only size legal for Formula Vee.

OK? Now each of the three *sizes* is further divided into three *grades*, which indicate size, again—not quality. In this area the factory inspection is obviously very rigid, as

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ILLEGAL GEARS AGAIN

LIKE IT OR NOT, WE'RE STUCK WITH IT!

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Every so often a rumor, report or downright flat statement is received to the effect that some drivers are using "illegal" gearing. This *could* be true, but I am inclined to wonder if it is as prevalent as is apparently suspected.

Now there is a very real possibility that illegal gearing is being used, even though it is rather remote. It is common in other Formula cars and Sports Racers to use a VW transmission converted to five-speed gearing. This requires removal of the reverse gear, and a few other minor changes, but it can be done. A five-speed transmission would be pretty hard to hide, I would think, but possibly only four of the gears could be used.

The only advantageous way to use them would be to run a higher third gear than even the legal transporter third, a *much* higher second gear which would extend into the normal range of the present third, and perhaps a higher first, as well. This combination could be used to advantage for better acceleration in the high speed range, but it would be sick coming off the line. (Did you ever notice how the Vees have to dodge the Juniors when they start off together?) This might be a clue to a really flagrant violation.

I'm positive, however, that no one is using illegal gearing for more top speed on the straights. You can get higher gearing than you can profitably use, just by installing a straight transporter transmission, or by using larger rear tires.

Below is a chart showing all the legal gears and the possible combinations, reprinted from the No. 12 VeeLine, with an additional column, which you may be able to persuade your tech inspectors to use as a check for deviations. To use it, jack up one rear wheel, put a degree wheel on the crankshaft pulley, and put the car in gear. Slowly rotate the rear wheel until the degree wheel comes around to zero and make a reference mark on the tire. Then rotate the wheel forward one complete turn while someone watches the degree wheel. The reading should correspond to one of those in the table if legal gears are being used. No figures are shown for first and second gear—if third and fourth are legal, it's safe to assume that the rest are. (Check for reverse gear at the same time, though. Jim Patterson—SCCA—contends that no special mention of them is needed in the rules—that they're automatically included in a "standard VW gear set.")

4th Gear				
Trans.	Diff.	Overall Ratio	Turns plus Deg.	
0.89:1	4.375:1	3.89:1	1	340
"	4.125	3.67	1	300
0.82	4.375	3.59	1	286
"	4.125	3.38	1	248
3rd Gear				
1.32	4.375	5.77	2	319
"	4.125	5.45	2	261
1.22	4.375	5.34	2	240
"	4.125	5.03	2	185
Split Case Transmission				
3rd Gear				
5.40:1 Overall		2 turns plus 252 deg.		
5.34:1 Overall		2 turns plus 240 deg.		
4th Gear				
3.63:1 Overall		1 turn plus 293 deg.		
3.59:1 Overall		1 turn plus 286 deg.		
(Variation due to two different ring-pinions)				

This is probably a good place to discuss the VW overlap. It is commonly assumed, again, that the VW cam has practically none. It says so in the book. However, it should be noted that the specs in the book are taken with the valve lash (clearance) set at .040". That *forty thousandths—not* four. With that amount of clearance, it is true that the crank is almost at TDC when the intake valve starts to open, and the exhaust valve is completely closed just a few degrees later. However, at *normal* clearances it is obvious that both valves are open about .050" at TDC, and the actual overlap is more like 60 crankshaft degrees. And that ain't bad!

Okay, so back to where the action is—in the cylinder. With both valves open at the same time, how do you prevent the exhaust and intake gases from getting all stirred up together, and keep them moving in the right direction? Well, basically it's fairly simple—once the exhaust gases start out of the cylinder and down the pipe, they tend to keep right on going, just of their own momentum, so that at the end of the stroke, with the valves both open, they *may* even leave a vacuum behind which will start to suck in the intake mixture before the movement of the piston takes over. The word here is "may," which is what this is all about.

The exhaust gas doesn't exit in a nice steady "whoosh," like when you blow out a match—it's movement is in the form of pulses, which are actually sound waves. At the end of the piston stroke, then, the actual *average* pressure has been reduced to somewhere near atmospheric; but the pulses—sound waves—continue to echo back and forth in the exhaust passage, creating alternate positive and negative pressures which may vary by as much as 5 lb. per square inch. OK, so it becomes obvious that if we could close the exhaust valve while the pulse is at a negative value, and intercept the following pressure wave, we'd trap a partial vacuum in the cylinder which could start the next charge of fuel mixture on its way independently of the piston.

Let's consider for a moment sounds in general emanating from pipes. Whether it's a firecracker in a culvert or a note on a trumpet, the "frequency" or "pitch" of the sound depends on the length of the pipe, which determines the length of time required for a sound wave to travel (at 1100 ft. per second) to the open end of the pipe from its point of origin. As it exits the pipe, it leaves a vacuum behind which air rushes in to fill, creating a pressure wave which travels back to the closed end (in the case of a trumpet or exhaust pipe, at least) where it is bounced back again, creating another pulse, and so on. The longer the pipe, the longer it takes for this to take place, and the lower the "pitch" of the sound wave. A tuba has a much longer "pipe" than a trumpet.

Speaking of musical instruments, there is another phenomenon regarding sound which applies to exhaust tubing, too. You can get two or three different pitches of sound from a pop bottle by blowing across the open end. You can get several notes on a bugle, but not all of them. If another pulse is started just when the first one is at a neutral point (between positive and negative pressure), both sound waves can exist at the same time without interfering with each other, doubling the pitch or frequency of the resulting sound. This can be doubled again and again, as is shown in the variations possible in a bugle. These notes are all dependent, however, upon the length of the pipe. In order to obtain tones in between those possible with a bugle, keys are provided on a trumpet which direct the pulses through alternate longer or shorter passages. These, too, will produce sounds compatible with their length, but not notes in between. (Yes, some top trumpet players can slide smoothly up the scale with no apparent breaks between the notes, but this is another case of "it's what's up front—behind?—that counts.") The trombone is the instrument most closely identified with our basic subject, however. It's overall length—and its resonant frequency—are infinitely variable so that *any* note can be played upon it.

So there you have it! All you have to do is select a pipe which will have a frequency which will create a negative pressure in each cylinder just as the exhaust valve closes. We're not going into mathematical formulas—that's been done by experts, and I'm going to accept their findings. A great deal of research has been done in this field, and it has been shown that the theoretical figures are very closely confirmed by actual dynamometer tests.

There's a slight catch to this, however—each of us will have to select the engine speed at which we want our power boost to show up. As we've said, there is only one engine speed for any specific length of pipe at which the extractor effect will be at its maximum. Above or below that speed, the effect falls off rapidly, and there will also be one speed at which the valve will trap a positive, rather than a negative, pressure in the cylinder. However, this probably won't be in the usable range of engine speeds; and even if it is, the adverse affect will be less than the benefit gained at the optimum speed.

If you're running short courses and seldom peak out in fourth gear, you might want to tune for acceleration at the lower end of the tach, or you might want to go for a couple of hundred rpm's below your normal top speed for more continuous acceleration at that point.

On the other hand, if you run on long straights, where you scootch down in the seat, push the throttle to the bending point, and use body-English trying to get the tach needles one notch higher, that's probably the point at which you could use tuning to the best advantage. You'll want to consider your performance in third gear, too, of course—how much you use it, and where.

There are two ways you can go in building a tuned exhaust system. In fact, if you are using the common crossed-over-front-pipes set-up now, and your pipes are in the neighborhood of 51 inches long, you already have a pretty good system, tuned for maximum effect at 4000 rpm. If you want to go for 5000 rpm, however, it becomes a bit more of a problem. Due to the fact that our "free" exhaust system still must terminate "one to three inches behind the body," you won't be able to use the 41" pipes required for this speed. The front pipes won't stretch that far. There's another way you could go, however—you could double this length and use 82", if you could find room for all that plumbing.

Separate pipes would be a rather chintzy way to go, anyhow. You do want to increase spectator appeal, don't you? This dictates, of course, that you go to a "bundle-of-snakes with a megaphone." This, too, is going to present some problems from a space standpoint—even with the last three feet or so composed of a single pipe, you'll still have around ten feet of additional tubing to dispose of. According to the authorities, a four-into-one system should measure 92" from the

"WHAT DO ALL THOSE LITTLE MARKS ON A PISTON MEAN"

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there is only .0004" (that's four *ten*-thousandths) difference between each of the grades. Cylinders which are right on the money are marked with a splotch of pink paint, those slightly smaller are marked with blue, and green is used on the slightly oversize ones. (Those not falling within these limits are presumably destined to become "oversizes.")

That's about all there is to cylinder designation, but pistons are something else. They, too, will have paint markings corresponding to the cylinders they are intended to fit. Depending upon how long the dealer has had them, the green, pink or blue (purple) mark may be a circle, a round dot or merely a brush mark. In addition, the actual size will be stamped into the metal — a "blue" piston will also show "76.95," a pink one "76.96," and a green, "76.97." Millimeters, that is. It hardly seems that a hundredth of a millimeter (.0004") would be worth worrying about until you realize that standard VW clearance for new parts is 1½ to 2 thousandths which means that if you put a "green" piston in a "blue" cylinder, you might end up with only half-a-thousandth clearance. On the other hand, especially in FV, where the break-in period consists of driving mildly to pregrid, a little extra clearance wouldn't hurt a bit. In other words, don't use a piston in a cylinder which is "graded" smaller, but don't worry about a "blue" piston in a "pink" or "green" cylinder. In fact, it might be a good idea! OK, so much for that, but don't go away — there's more!

Also stamped into the metal, perhaps all by itself, or perhaps so as to appear a part of the size numerals, you may find a "plus" or a "minus" sign. This indicates "weight grade." Those without either of these marks will be within the limits for "standard weight," those lighter than standard will have a "minus" sign, and heavier ones will have a "plus." Depending again on their age (exact procedures have been changed several times), you may also

find the plus or minus marked in red paint, OR there may be merely a splotch of brown paint on a "minus" piston, or gray for "plus." If you have a choice, get them all with the same sign — preferably "minus," of course. If you can't get them all alike, get at least one "minus" and lighten the others to match it (VeeLine No. 17).

Come back here! We're not through yet! You will also find a "W" (for "weiss" or "white") or an "S" (for "schwarz" or "black") stamped into the piston metal, and perhaps a splotch of paint of the corresponding color. This refers to the corresponding "grade" or size of wrist-pin, which probably won't be of any concern to you, but is to the worker at the factory who fits the pin to the piston.

There is one more important mark—an arrow. This arrow must point toward the flywheel when the piston is installed. The wrist-pin is located slightly off the centerline of the piston (perhaps you've noticed) for a rather complicated engineering reason having to do with piston-slap, so installing the arrow in the wrong direction would aggravate the condition it was designed to correct.

You may also find one more mark—a letter or number—which is an inspector's stamp, or something—nothing relevant to piston fitting, at least.

Incidentally, these marks are pretty hard to find after you've cleaned the top of a piston a few times. When you mark your pistons so you can replace them in their original location (you do, don't you?), use one, two, three or four center-punch marks, and place them at the flywheel side of the piston. They'll be much easier to find than the arrow five or ten years from now.

While we're on the subject of pistons, a few more comments may be in order. For one thing, wrist pins may vary from tight to almost-but-not-quite loose. They may be loose enough for a finger-push fit, or even

loose enough to fall from the piston of their own weight, but you shouldn't be able to actually feel any play when moving them sideways. There shouldn't be much more than that in the con-rod bushing, either—1½ thousandths is the VW wear limit.

When removing or installing pistons, unless the pins are loose enough to be easily pushed out, be very careful not to bend the con-rod. If you have to use a hammer, be sure to back up the piston with something, like a length of 2x4 lumber, so that the piston—not the rod—takes the force of the blow. Volkswagen specifies heating the piston with a special electric heater, so as to expand it. A torch, turned low and played all over the piston surface until it is hot enough to sizzle, will do the same thing. Probably the simplest method (once you have made it) is to use a tool such as was described in the No. 29 VeeLine. It really works, and does the job with no chance of damage to anything. Use STP on the pin and the bore of the piston. It can make the difference between a finger-push and a drive-fit.

CONGRATULATIONS!

—to our new officers, President Bob Ames, Vice President John Beck, and Secretary (again) Harriet Gittings. None of the ballots are back yet, of course, but I think it is safe to assume that they will be elected almost unanimously.

Some time within the next year, I am going to propose an amendment to our constitution to the effect that if there is only one candidate for each office, ballots won't be required. If there had been room it would have been on this ballot. It seems silly, really, to go to the time, trouble, and expense of sending out a ballot, when there is no contest to be decided.

By the way, I don't believe it has been mentioned before, but if you are considering volunteering for office next year, perhaps this will help you decide: Ex-Presidents all become Life Members automatically. No more dues! Not only that—Volkswagen presents them with a small gold and enamel replica of our emblem, complete with clips to make it either a lapel pin or tie tack. Now aren't you sorry you remained silent?

(We donated four complimentary one-year memberships as prizes for a Vee relay team at a Formula Racing Association event recently. Harriet won one of them.)

"FROM A RELIABLE SOURCE"

"Dear Don—Thanks for a very interesting telephone conversation last night. Your suspicions are confirmed. It took about a half-hour of talking, but Goodyear confirmed that the 'gumball' tire compound was dropped in mid-year.

"John Jones* of Goodyear Racing Division confirmed that around June or so the compound was changed from R-4 to R-5. He also let slip that only two batches of tires were built with R-4, and of those only the first batch showed the phenomenal adhesion and associated poor wear characteristics. He also stated that in general, the new tires were gaining good acceptance and giving better wear, and were *almost* as good. . . ."

Joe Doakes* (*Names changed to protect a possible source of future information.)

valve head for maximum effect at 5000 rpm, and you'll have to use even more for lower speeds, as shown below:

3000 rpm	153"
3500	131
4000	115
4500	104
5000	92 or 153"
5500	84 or 136"
5700	131

Did you notice that, due to the effect of doubling frequencies, you could get benefit at both 3000 rpm and 5000? Or at 3500 and 5700? Especially if you're using transporter third gear, however, you aren't running at 3000; and not many of us will be worrying about more power at 5700, either.

Have you noticed that nothing has been mentioned in regard to the diameter of the pipe? This seems to be of no consequence, as far as theory goes. However, it seems to be accepted practice to use pipe about the same diameter as the exhaust valve, which is about 1 3/16". This would call for 1½-inch tubing, which is always specified by outside diameter. On the other hand, the exhaust port is about 1 3/8" diameter, or the same as 1½-inch tubing. From a practical standpoint, you'll find a much larger variety of bends and accessories in the 1½" size than in 1¼".

Which brings us down to the hard facts of starting to design and build an exhaust system. Tubing bends can be purchased and welded together with appropriate straight sections much cheaper than you can get the bends put into a continuous length of tubing. There is also the advantage of being able to experiment and correct mistakes. Look for "mandrel bends" when you're shopping. This refers to a bending method in which a plug or "mandrel" inside the tube follows the bender, keeping the tube round and wrinkle-free. Some bargain bends are made on a conventional bender which leaves a flattened oval section through the bend.

Tubing bends can usually be found at hot-rod shops, some auto parts houses and some mail-order stores. If you have no other place in mind, the J. C. Whitney Co., 1917 Archer Ave., Chicago 60616, has a good assortment. Their catalogs are sometimes available at newsstands and magazine counters, or you can write them for a copy.

WHAT'S NEW?

The old stand-bys, as well as some of the relative newcomers to the Vee building business, are listed in the '69 "All About Formula Vee" booklet. Here are a few recent additions:

First, the Lynx is making a comeback. The new Lynx, that is. There's nothing old about it except the name. It's simple frame structure is based on a pair of 2 x 4 rails (rectangular steel tubing, that is) with lighter rectangular tubing for the rear trailing arms. It's been designed with easy maintenance in mind—the two-piece body is easily removed, and the engine can be reached or removed without major surgery, or even skinned knuckles. (Lynx Competition Cars, 23363 Baske, Taylor, Mich. 48180)

Then we have the McNamara "Sebring Mk. I," which, as has been mentioned before, is being built in Germany, but will be sold in limited numbers in this country, too. The U.S. version, of course, will have single trailing arms, 1200 front suspension, and will meet all the other legal requirements. Our new Vice President has just signed up with them as their U.S. distributor, and is making arrangements for their participation in the big Vee event at Daytona on January 31. Three of them are expected, with top European drivers.

It's a luxury model, with plenty of chrome and upholstery, and touches like a built-in fire extinguisher system. (Pull on a ring, and both the engine and driver are covered from all directions with the German version of "Purple K." They're also building Formula 3's for European consumption only. (Beck Racing Enterprises, Box 674, Mason City, Iowa 50401)

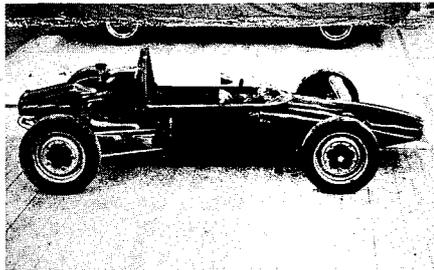
You may have noticed, in the "Sports Car" National Point standings, a couple of "Zeitler" Vees. You may also have noted Steve Burtis drove a "Zeitler" to third place at Riverside, eight hundredths of a second behind the winner, Bill Scott. John Zeitler's two prototypes have been well wrung-out in the N.E. Division in the past year, and they are now in production for real. They have to be among the better ones—those in their brochure (no photo available for reproduction here) show our big "FV" emblem. (Zeitler

Racing Design, Box 3451, Stamford, Conn. 06905)

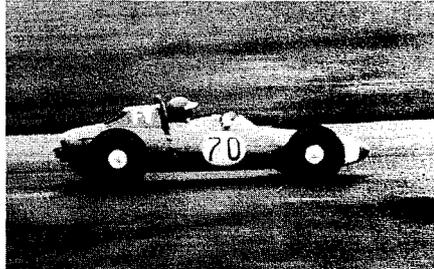
Another newcomer is the "Malo". It's a pure wedge design, very good looking in the colored picture (which couldn't be reproduced for these pages), and the price is right. (Sports Ltd., 3713 Fishcreek Rd., Stow, Ohio 44224)



The New Lynx



McNamara "Sebring"



"Venus" Vee. You've seen it topless in the ads — here it is in full dress.

MEMBERS' SOAPBOX

"...In other classes the variety of marques, with varying handling characteristics, gives many opportunities for passing. Passing in FV is the result largely of driving differences. While all classes now need rules spelled out in more detail, the need is acute in F/V.

"By comparison, in yacht racing any contact indicates a foul or error by one boat and leads to disqualification. The rules on right of way are complete and detailed, and every racer must know them by reflex to compete."
Ralph Nodine, Mays Landing, N.Y.

"...I appreciate your taking time to suggest that I join someone's pit crew. However, I don't know anyone around here who owns a Vee. I have had experience working on VW engines, but the closest SCCA track is Pocono International. If you know of any owners in the vicinity who could use my help, please let me know."

Barry L. Kromer,
486 E. Lawn Road, Nazareth, Pa.

UNCLASSIFIED ADS

FOR SALE: New fiberglass noses for Form-cars. \$35.00. Gene O'Brien, 300 Speer Blvd., Denver, Colo. 80203.

FOR SALE: Zink Z-bar, mounted on MKIII Autodynamics. Four near-new Firestones, 2 Dunlops, BRG paint, New stronger roll-bar. \$1400. Will deliver one easy day's drive from Phoenix for small extra charge. Bob Adams, 2222 N. 22nd St., Phoenix, Ariz. 85006.

FOR SALE: '68 Crusader. Impending transfer forces sale—competitors will be wearing black pj's instead of Nomex. Maj. R. A. Davies, 212 S. 90th, Apt. 120, Tacoma, Wash. 98444 (206)475-5986.

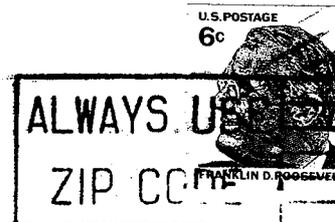
FOR SALE: Bobsy Vanguard (Lee Talbot's silver "62"). Many mods—Z-bar, steel under-seat gas tank, front bracing. Cassis Engine. \$1250. Grant Reynolds, 12917 Matey Road, Wheaton, Md. 20906 (301)933-4340.

The VEE LINE of
FORMULA VEE INTERNATIONAL
Don Cheesman, Director
Box 291 Ephrata, Washington 98823



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