

Lou D'Agostino of Florida Sports Cars (see *Engine Builder's Shopping Guide* on page 69) typifies the pro engine builders SportsCar® talked to: "We're all striving for perfection—it comes from hard work."

Secrets of the Engine Builders

How Do They Find Those Extra Horses—
And Should You Try To Do It Yourself?

By Don Fuller

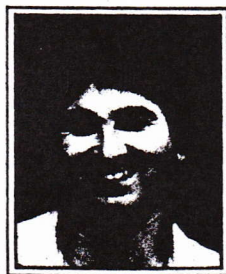
For many racers the engine is the most mysterious part of the car. We're not talking mechanicals here. What seems unfathomable is how a pair of seemingly identical engines can deliver decidedly unequal results. Why are some more equal than others?

Why, indeed. Those engines consistently "more equal" seem to appear from the same sources: the professional engine builders. So how do those guys do it?

To find out, we talked at length with five leading professionals specializing in building Ford-based (FF and F Atlantic) and FVee engines—probably the most difficult to extract extra power and reliability from. (For a list of these and other builders see the guide on page 69.)

We did not expect anyone to divulge

specific trade secrets: The knowledge that produces superior products is hard-won and, quite rightfully, carefully guarded. You won't find out here, for example, the correct bearing clearance for a 1600 Ford. What we did find out is more valuable—the real secret of engine building.



Curtis Farley
The Dominator

If there is an entry level single-seater class in SCCA with tradition and history, it is Formula Vee. If there is an FV engine

builder in the country with tradition and history, it is Curtis Farley—for starters, his engines have won nine of the last 10 FV National Championships.

Nine of the last 10.

How does this sort of dominance happen? Basically, with Farley as with the others, it happens with a lot of care, a lot of time spent on development, a lot of knowledge accumulation. "Anymore, the engine-building business is getting like the car-building business," says Farley, calling it "competitive and technical... the individual just can't do it anymore."

Well, the individual *can* do it, of course, but what Farley means is that the individual can't do it and be fully competitive, consistently, reliably. There may be *some* who do their own engines fairly well and you may be one of them, but the list of successfully competitive individual builders is not a long one.

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For example, Farley discussed a piston ring concept that resulted in a measurable power increase. There's no "secret" to this but a lot of hard work, dyno time, analysis, checking and rechecking—normal workday fare for a professional but, for most individuals, the kinds of things that are either impossible or crammed into a few available nights and weekends.

Then there's the extra care: "I take a lot of care to make sure the environment they're putting the engine into is a good one," says Farley. "Is the carburetor receiving sufficient air? Is the cooling system doing its job and not cutting horsepower? Does the lubrication system keep things oiled properly?"



Joe Stimola

Four Key Reasons

For Formula Ford racers, Joe Stimola's name is certainly familiar, and he's been an East Coast Ford builder of proven reputation for several years. He noted four differences between professional and amateur engine builders.

- 1) Homebuilders usually end up spending more money than if they had bought an engine from a professional in the first place.
- 2) Roughly 75 percent of the homebuilts that come into his shop for rebuilding or servicing are illegal in some way. This is not necessarily in the realm of cheating but in things simply being incorrect: wrong piston weights, illegal polishing and so forth. In other words, mistakes. Homebuilders have limited access to good information.
- 3) Stimola figures he does at least 100 Formula Ford engines each year. From his experience he knows what works and what doesn't, and what are the latest techniques.
- 4) A properly done professional engine, correctly cared for and driven, should be good for 12 to 15 regional races. In his experience Stimola has found most amateur engines generally deliver only four or five such events.

This last item brings up an interesting point—the value of a professionally-built engine to a regional driver. One would think this driver is the least likely to need a pro-built engine. Uh, uh, says Stimola: "At the regional level, (the driver) should go to a professional engine builder and car builder; until you know what's going on, you should go with the best." Stimola thinks the beginning regional-level driver needs to find out "if it's you or your equipment."

With identical engines powering SCCA formula cars, one or two horsepower can be a critical advantage, and pro engine builders know how to find them.

To follow this up, Stimola—like many other engine builders—goes to the races often, attending maybe 25 to 30 events each year and all the regionals in the area, so he can lend assistance to the beginning drivers.

If there are any secrets the East Coasters are hiding from the West Coasters, or vice versa, Stimola thinks the tight nature of East Coast tracks such as Briar or Lime Rock has led to FF engines which produce more power and torque in the lower and middle ranges. West Coast tracks—Riverside, Willow Springs, Portland, Laguna Seca—with their longer straights and faster turns, have led to engines with more upper end punch. Stimola puts Atlanta in the "West Coast" category, by the way. He thinks one difference is that West Coast engine builders tend to run piston clearances looser and employ less ring drag. This reduces internal friction and, while it helps all across the engine speed range, it tends to help somewhat more on the upper end. On the East Coast Stimola believes there is a trend to build one type of engine for the season, then another specifically for Atlanta—more-or-less like what the West Coaster would use all year. But there's a trade-off for this reduced internal friction. Although specifics are difficult to quantify, there is evidence it leads to a shorter service life.



Arnie Loyning

West Coast Guru

If there is anyone who should know about the "West Coast" engine, it's Arnie Loyning. Says Loyning of the amateur-built engines: "Usually what I see is that they spend a lot of time working on things that don't make a lot of difference." He mentions operations such as polishing rocker arms or pushrods, deburring blocks, "getting carried away by putting studs on the heads," and lots of fancy aircraft bolts. Loyning thinks these things may not necessarily be a deterrent to power but that amateurs tend to "miss on some of the important stuff that they wouldn't really know. . . . As soon as you have a chance to use a dyno (you find out that), nine out of 10 ideas are just a waste of time."

According to Loyning, work has to go into things that matter: heads, manifolds, reduction of internal friction. If there is a "secret" to engine building, it is careful attention to meticulous details, with no substitute for the knowledge gained from experience. There is no Demon Tweak. "It's



GEOFFREY HEWITT

pretty rare that we see something a lot different," says Loyning.

If Loyning strives for anything, reduction of internal friction is high on the list. "I think low friction makes a difference every place on the power curve." He points out that slipperier internals are not going to make the engine last as long, "but that doesn't mean the engine is going to blow up. It just means the power is going to go away (sooner)." Even then, he figures one of his FF engines is good for 15 hours, or roughly 8 to 10 race weekends.

As to his opinion on the difference between engines for the East and West Coasts, Loyning says: "The difference between East Coast and West Coast is that they don't have as much horsepower as we do, so they have to say *something*."

We imagine those on the East Coast will probably have their own opinion on the subject. . . .

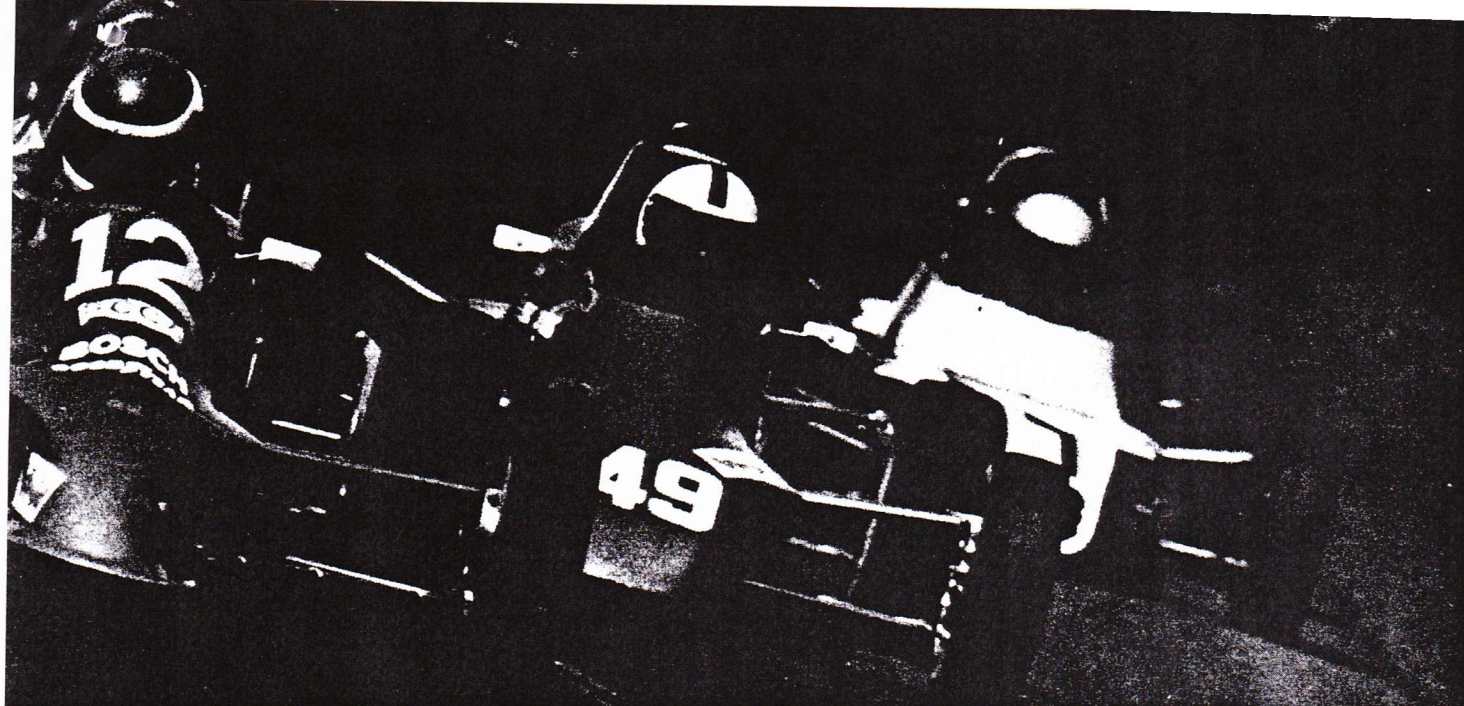


Jay Ivey

Squeaking It Out

Jay Ivey worked for Loyning for about three years and for the last couple of years has been running his own shop. What does he think the professional is going to find that the amateur or individual won't? "I think a little bit of everything," he says. "The professional engine builders can squeak a little more power out of them," he notes, and that comes from "the experience in doing so many."

All that experience adds up. "We do it full time and we spend a lot of time on develop-



ment, as far as trying different things," says Ivey. He noted such detail areas as bearing clearances, flow, testing all the camshafts available for Fords. "Trying a bunch of things and spending a lot of time in the shop," he called it. And he reinforced the concept of care: "We take a lot of care in doing the engine; paying attention to the small stuff." It's that attention to detail that makes the difference—"You can't just buy the Tweak-of-the-Week, plug it in and hope to go," notes Ivey.

Still, Ivey figures there are individuals out there who can do capable work, and toward that end he is offering his new kit engine concept. It contains everything needed to assemble a brand-new, fully competitive FF engine. According to Ivey, the parts are exactly as they would be if arrayed on his bench, awaiting assembly. He's taken care of all the clearances, the bearings are numbered, the carburetor is prepared, the rockers profiled, head flowed, manifold ported, crank balanced, flywheel and clutch balanced, the front cover has a tach drive, all the gaskets are included, even the spark plug wires are there. It's sold through Crossle Pacific for \$3500, compared to the \$4500 for one Ivey assembles.

It's for "club racers who like to do their own work," says Ivey. "They can have a good, reliable performance product. For the average club racer, it's a good deal. . . a good place to start." All one needs is a basic understanding and what Ivey calls "a little imagination."

With identical parts, will the individual's kit engine equal Ivey's in power output? Wellll. . . not quite. Where might the additional two or three horsepower come from? What, in other words, is Ivey's "secret?" Ivey laughs and once again mentions "imagination," but says he isn't going to reveal what he means. After all, he notes, "A lot of people would sell their mothers for two or three horsepower."



Steve Jennings

No Compromise

Moving up a few notches in performance level, we talked to Steve Jennings, who builds Cosworths for Formula Atlantic, is doing Tom Gloy's Trans-Am engines this year, and has also built Cosworths of the DFV, DFX and DFL variants.

"We don't compromise on trying to do something that's less than what we consider perfect," says Jennings, standing in the middle of his antiseptically clean shop. Being geographically close, we visited the shop to get an idea of what Jennings' concept of perfection means. Everything is orderly and neat. Separate machines for separate functions are in their logically designated areas. There are two dynos. If you could eat off the floor of anyone's engine assembly room, Jennings' would be a good choice. What kinds of things emerge from here that show the differences, the "secrets" of a Jennings engine? No breakthroughs, just hard work and attention to details. He has done his own piston ring design, has built his own jigs and fixtures for proper assembly, knows precisely through experience how to cool and heat matching parts for correct shrink fits, has pistons engineered specifically to his order and configuration. Sure, there are probably some "secrets" buried in here, perhaps something subtle in the crown of a piston, but those "secrets" will be based on the results of hard work on the little stuff, not some miracle flash from the clouds.

Jennings builds, typically, 100 or more

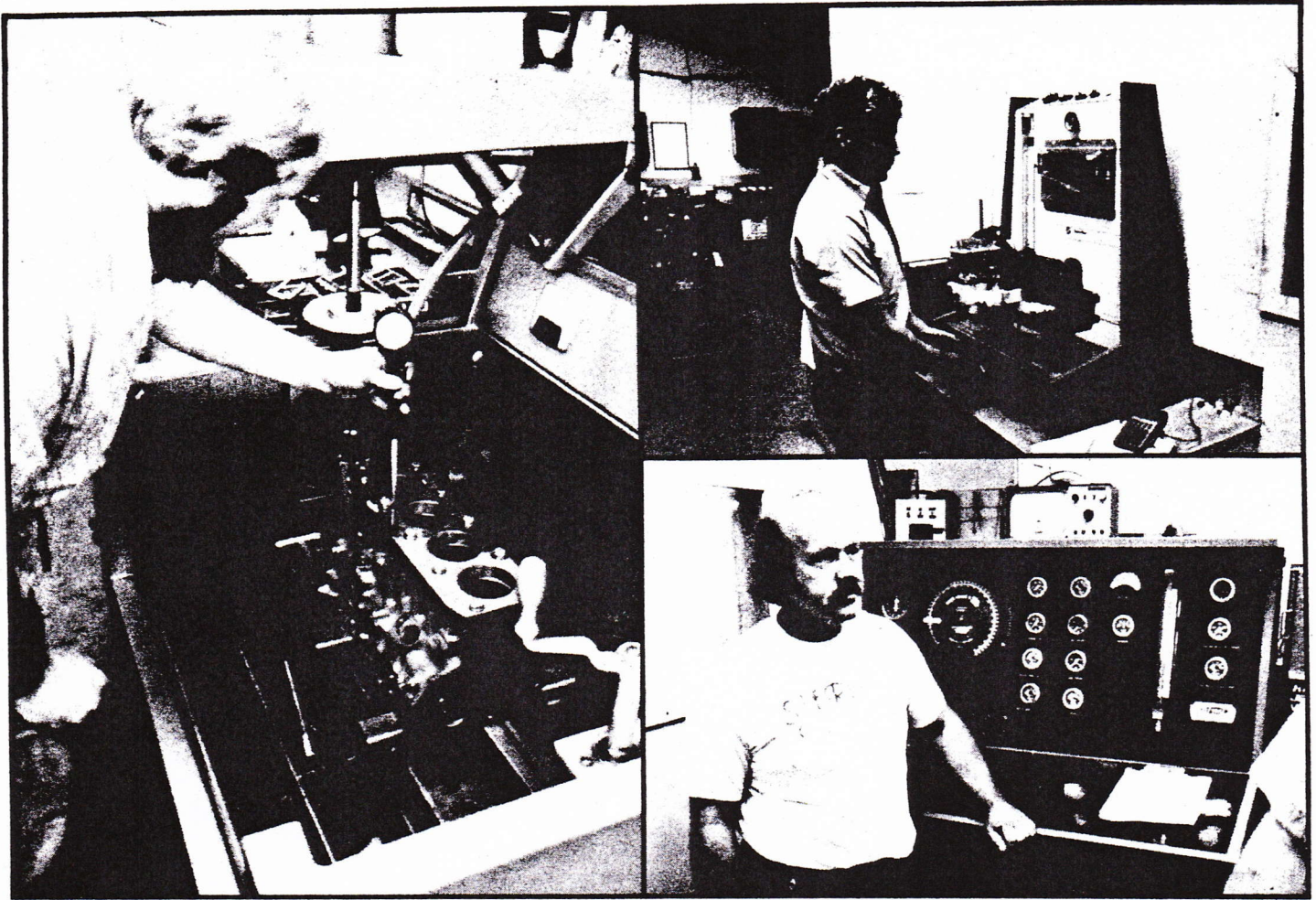
Cosworth Atlantics each year—that represents a lot of accumulated knowledge and an enormous background of experience: "We have tried just about everything that makes sense to try at this point," he says. "Anything that gets learned is incorporated into every engine after that." For the buyer, Jennings' experience will pay dividends. The racer may not end up knowing a "secret," but he will certainly be able to use it.

Fierce Competition

If winning matters to the racer, rest assured it matters no less to the engine builders—it's a highly competitive *business* as well as sport. "It's pretty fierce, really," is how Farley describes this competitiveness to win. Says Ivey: "I think there's a personal competition between us," although he also noted that most builders get along well with each other, just as a couple of racers might socialize in the pits and then go onto the track and drive each other's wheels off. Stimola concurs with this: "You'd be surprised at how much in agreement we all are," he says. "There's a fair amount of cooperation that goes on," he continues, but adds that still "nobody wants to lay over and die" when it comes to winning.

As to what exactly makes a good engine builder, the answer to that will vary for every individual in the business. For instance, Ivey's father was a test engineer for Detroit Diesel and his uncle was in charge of Ford's dyno labs in Dearborn; he was always around engines, in one way or another. "I like the work and I really like the challenge," says Ivey. "The challenge is always there and my goal hasn't been reached."

For Farley, he came into the engine-building business rather indirectly. As a teen-ager, he figured the only way to afford racing was to build his own engines. After a time, the engine building became a major part of the operation, even though he still



Pro engine builders not only have the knowledge but the specialized equipment to put it to best use. This is Sterling Race Engines in Jackson, California. At lower right is owner Ken Castagnino at the shop's dyno controls. At left Bob Sanders measures the cylinder walls he has just power-honed, and at top right Randy Porath flow tests an S2000 cylinder head and inlet assembly. (courtesy Sterling Race Engines)

The Engine Builders

drives and will be doing about 12 to 14 races this year in Super Ford in Canada. Why did he get started: "I really don't know; I should have taken up golf or something," Farley says with a laugh.

And for Stimola, he was always around racing, beginning as a crew member when only 12 years old for Bill Wonder at Vine-land, New Jersey. By 17, he was crewing for a GT40 team at the Daytona 24 Hour—and still played high school sports. After serving in the Navy, his father helped him start the racing business he now operates, setting up cars and building engines. Along the way he's had the opportunity to meet the cream of the crop of American racing, working with the likes of Bobby Rahal, Danny Sullivan and Price Cobb during their Atlantic days. "I like going to the races" about sums it up for Stimola, a man who hasn't lost the enthusiasm he first found as a 12-year-old. In fact, if things are a little short, he might sometimes still be found helping out with flagging at a race.

More Cost Effective

Through all this, there is one important point to remember: While the professional

is almost certain to build a stronger and more reliable race engine, he will also do it for considerably less money than the individual, as Stimola noted earlier. True, there will always be those who derive great enjoyment from building their own engines; as Jennings says of a racer who would assemble his own Atlantic powerplant: "If his hobby wants to be building a fairly sophisticated engine and he knows enough about it not to screw it up, then I say more power to him." Ivey admitted that "I've done engines for people who have done work out of their house and some are not too bad." Still, in his view, the homebuilders will "end up spending more money than if they had just bought a brand new engine."

This idea of cost effectiveness kept cropping up in all our conversations. As Farley put it: "The cost of learning, and the cost of investing in equipment to be competitive, far outweigh the cost of buying the finished product." Achieving competitiveness is the part that's difficult for the individual. Says Stimola: "A guy doing his own can't possibly have seen all the things we've seen by doing 100 or so a year. An amateur doesn't have a dynamometer to work with, so he doesn't know whether it's good or bad."

And then, of course, the matter of cost ef-

fectiveness and competitiveness goes beyond just the engine; it includes the whole car. You've got to use your time and money most effectively: "If you can delete that end of it," says Farley of the engine building, "the rest of your time can be spent on the chassis. You're better off and time ahead, certainly money ahead, by getting a proven product and doing it that way."

A final comment from Joe Stimola is worth thinking about. Properly applied, it could save many an amateur racer a bundle of misery. "The biggest problem in SCCA racing," says Joe, "is that for 99 percent of the people it's a hobby, and because it's their hobby they treat it like it should be my hobby, too." Stimola and his fellow professionals are in racing as a *business*. To survive, they must deliver the best product possible. They will usually know more about their business than the amateurs will know about their hobby. It's simply in their best interest, because they know that if you're not happy you can easily go somewhere else.

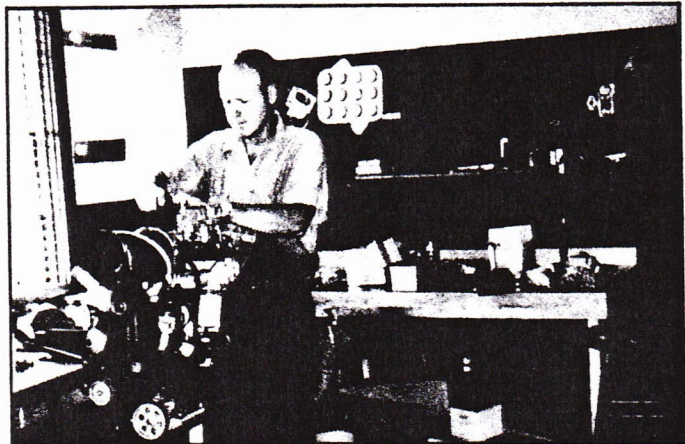
Unavoidable conclusion: There are few genuine "secrets" in the horsepower game. A good race engine is more the result of perspiration than of inspiration. It's called sweating the details. □

Engine Builders Shopping Guide

The following data was obtained by *SportsCar*® from some of the better known U.S. club racing Ford engine specialists. The chart is by no means all-inclusive, but is representative of the range of prices and services available. In those instances where Ford engine builders also build FV engines, Vee information has been provided as well.

Prices given in the chart are subject to change without notice and can vary to some extent depending on the dollar/pound exchange rate and what an individual customer may want. Overhaul prices are especially hard to estimate, since what needs to be done will often vary from engine to engine. For that reason, Marcovici-Wenz Engineering did not give a figure for an overhaul. Information in the comments column was provided by the engine builders. For a complete run-down on contingency programs please contact the individual companies.

SportsCar would like to thank all the engine builders who took the time to help us gather the information for this article in the middle of a busy racing season. We plan to do an even more comprehensive survey in the future, and if you are a professional engine builder and would like to be included, please drop a note to *SportsCar* at 1920 E. Warner Ave., Suite L, Santa Ana, CA 92705.



Rollin Butler of Cricket Farm Motors puts on the finishing touches.

Company / Owner	Engines and Prices			Other Available Services	Trackside Support Available	Contingency Programs	Comments
	Type	New	Overhaul				
C.F. ENGINES 1809 Ft. Riley Blvd., Manhattan, KS 66502 □ (913) 537-4010 Curtis Farley / Owner	F1600	\$4750	\$ 800	• Dyno Tuning • Balancing • Cylinder heads • Parts	• MW and Cen-Div regionals and Nationals • Runoffs—parts & tech help	• Runoffs • Pro S2000 • Canadian Tire F2000	FV National champs 9 of last 10 years. Reg. and Div. champs too numerous to list. 1984 CDF FF champ, 8 FF National wins in 1984. 1985 is our fourth year building F/S2000 engines. Our F2000 engines won both 1985 season opening Nationals in Florida.
CRICKET FARM MOTORS Bldg. 31, Ohio Loop Rd. Greenville, SC 29605 □ (803) 277-1268 Rollin Butler / Owner	F1600	\$4200	\$ 950	• Dyno Tuning • Balancing • Cylinder heads • Parts	• SEDiv Nationals and Nationals • Runoffs—parts & tech help	• Runoffs	1985 — S2000 wins at Moroso and Sebring, FF and S2000 wins at Charlotte, S2000 win at Roebing Road. 1973 FV Runoffs champ, SEDiv champ FV, FF and S2000.
FLORIDA SPORTS CARS 4530 N.E. 6th Ave., Ft. Lauderdale, FL 33334 □ (305) 491-3939 Louis D'Agostino / Owner	F1600	\$4500	\$ 850-1200	• Dyno Tuning • Balancing • Cylinder heads • Parts	• All SEDiv Nationals & sel. regional • Runoffs—parts & tech help		1982 and 1983 SARRC champ, 1982 SEDiv FF champ. Building road racing engines since 1981. Can usually turn an engine around in a week—overnight in an emergency.
HASSELGREN RACING ENGINES 815 Gilman St., Berkeley, CA 94710 (415) 525-1164 Paul Hasselgren / Owner	FA	\$10,500	\$2200	• Dyno Tuning • Cylinder heads • Parts	• West Coast Pro races.		In business nine years. Customers include 1984 WCAR champ Dan Marvin. Hasselgren works on all motors himself.
IVEY ENGINES, INC. 2204-2 NW Birdsedale, Gresham, OR 97030 □ (503) 667-3616 Jay Ivey / Owner	F160	\$4500	\$1200-\$1500	• Dyno Tuning • Balancing • Cylinder heads • Parts	• West Coast races. • Runoffs—parts & tech help		Five years in the business. Have built BMW, Mercedes, Datsun and Volvo engines as well as Fords. Engines recently exported to England have done some record times.
LOYNING'S ENGINE SERVICE 211-F N.E. Victory, Gresham, OR 97030 □ (503) 661-0523 Arnie Loyning / Owner	F1600	\$4600	\$1200	• Dyno Tuning • Cylinder heads • Parts	• Selected races • Runoffs—parts & tech help	• Pro S2000 • Runoffs	1984—About 40 National wins. Pro S2000 champ and Canadian Tire F2000 champ. Four FF and three S2000 National championships. Will soon be doing some Super Vee engines.
MARCOVICCI-WENZ ENGINEERING 33 Comac Loop, Ronkonkoma, NY 11779 □ (516) 467-9040 Peter Marcovici—Ted Wenz / Owners	F1600	\$4600	NA	• Dyno Tuning • Balancing • Cylinder heads • Parts	• Selected Eastern races • Runoffs	• Runoffs program in the planning stage	The M-W partnership just started this year, but both owners have 15 years experience in the business. SV, Cosworth and all types of vintage engines are also handled.
PHP RACENGINES 950 N. Rand Rd. #107, Wauconda, IL 60084 □ (312) 526-9393 Mark Balinski, Barry Sale / Owners	F1600	\$4750	\$1000 +parts	• Dyno Tuning • Balancing • Cylinder heads • Parts	• Most Midwest Pro S2000 • Pro FA races • Runoffs—parts & tech help	• Pro S2000 • Pro F2000	1983 CenDiv FF champ, numerous poles and lap records. Winner of 1985 Kansas City G.P. Pro S2000 race.
QUICKSILVER RACENGINES 1101 Gude Dr., Rockville, MD 20850 (301) 340-2700 Sandy Shamlian / Owner	F1600	\$4800	\$1200-\$1400	• Dyno Tuning • Balancing • Cylinder heads • Parts	• NE and SEDiv and one or and CenDiv races—parts and tech help	• Runoffs • FF • S2000	
STERLING RACING ENGINES 12104 Ridge Rd., P.O. Box 374, Jackson, CA 95642 □ (209) 267-5081 Ken Castagnino / Owner	F1600	\$4400	\$450 +parts	• Dyno Tuning • Balancing • Cylinder heads • Parts	• Laguna Seca. • Sears PL & sel. SoPac & NoPac races • Runoffs—tech	• Nor-Am Pro Ford • Western Empire • Pro S2000	Four Nor-Am Pro Ford championships, numerous National wins in FF, S2000, FC and CSR. IT, SV, and Cosworth Ford engines built by special request. In-house machine shop and cylinder head development areas.
STEVE JENNINGS RACING 1401 E. Borchard, Santa Ana, CA 92705 □ (714) 547-3717 Steve Jennings / Owner	FA	\$9800	\$1175 +parts	• Parts	• Selected West Coast races—tech help		Two FA National championships and two CSR National Championships. 1984 Trans-Am and 1979 Pro FA championships.