

PORSCHE PANORAMA

APRIL 1993



911 Speedster:

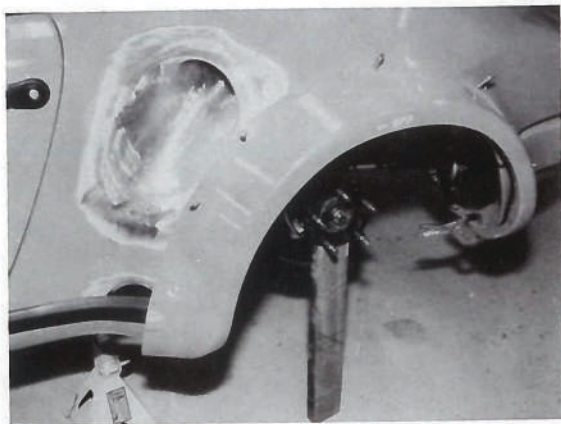
Bruce Canepa has created the ultimate hot rod Porsche for the open road

By Bruce Anderson
Contributing Editor

962 Power!



RON KIMBALL



Fitting 934 fender flares to the 1989 turbo-look Speedster. Notice 959-type intake duct in rear fender.

When we think of tuners we think of the German companies such as Ruf, Kremer Brothers, DP, RS Tuning, or maybe even the Almeras Brothers in France, but we don't consider any of the American shops that might be able to do just as well with this kind of work. There are a number of Porsche shops or "tuners" in the United States that can do all of the same sorts of modifications. One of these is a friend of mine, Bruce Canepa of Canepa Design in Santa Cruz, California. Canepa has just finished a 1989 911 Speedster that may just be the ultimate street hot rod Porsche.

Bruce Canepa has been involved with Porsches as a business, in racing and as an enthusiast for years, but most recently Canepa and his company have been known for their aerodynamic truck conversions and specially outfitted racing trailers. Canepa says that they have built about 70 percent of the large semi-trailers that are used in racing in this country, including vehicles for most of the Indy car teams, IMSA teams, vintage racing, stock car racing and drag racing teams. Canepa's trailer company, Concept Trailers, custom outfits the trailers that haul racing cars. Equipment ranges from the elevators used to load the cars and the side-mounted tents where the mechanics work on the cars at the races to completely furnishing the interiors like a motor home.

In addition to building trailers for racing teams, they custom design trucks and trailers for a variety of applications. A few years ago, they built the truck and trailer rigs used by Porsche for their Driving Experience. Presently they are making portable motion-based theaters like those at Disney Land and Disney World where rides simulate space ships, an F-16, a race car or blood traveling through arteries. The portable version has been made possible by the development of movable, self-contained, two-passenger seats. These seats can do a lot more, faster than the big movable floors can do. All of the responses

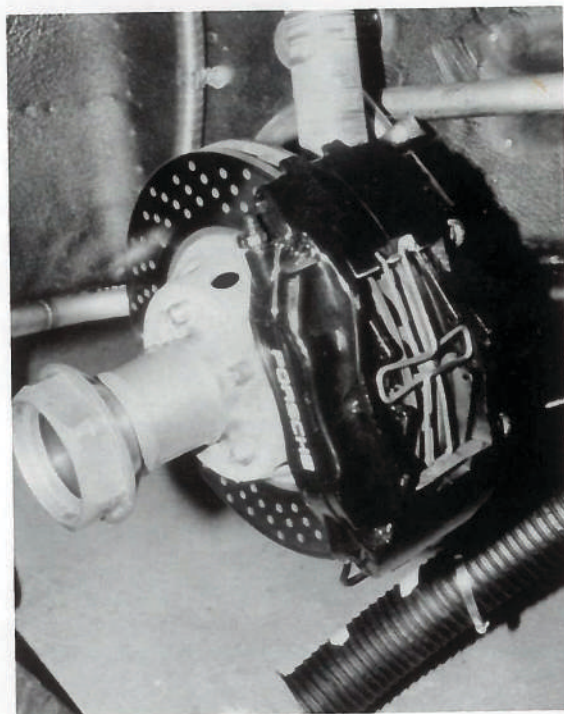
are controlled by a computer signal which is related to the visual action displayed on the screen and the pair of seats can respond faster and more accurately.

Concept Trailers designed and built the theater enclosures to put these seats into. Two semi-trailers lock together and become one theater with a 16-foot movie screen. They slide the seats in, lock them down to the floor, hook them up to the computer and they're ready for action. If you have not been in one of these motion-based theaters yet, try one. They are so realistic that you feel like you are in the cockpit of an F-16 or a space ship or race car or whatever the simulation is, "because you really are."

Starting with slopes

Canepa Design did a lot of Porsche slope nose conversions when they were all the rage in the 1980s, developing their own slope nose conversion in 1983. Canepa felt that his company could do as well and maybe even better than the factory conversions. All of the brackets and mounting hardware for the Canepa Design slope nose cars were made of stainless steel to prevent corrosion. They used factory fenders on which to do the slope nose conversion and re-zinc-coated them for rust prevention. They did a lot of slope noses while they were still the fad, including one car for a customer in Australia.

In the mid-80s, Canepa Design decided that if their conversions were good enough for Porsches they



Right front wheel well shows detail of 935 hub and rotor with Brembo brakes. Flexible stainless tube in the background is the exhaust pipe for the Speedster's gas heater.

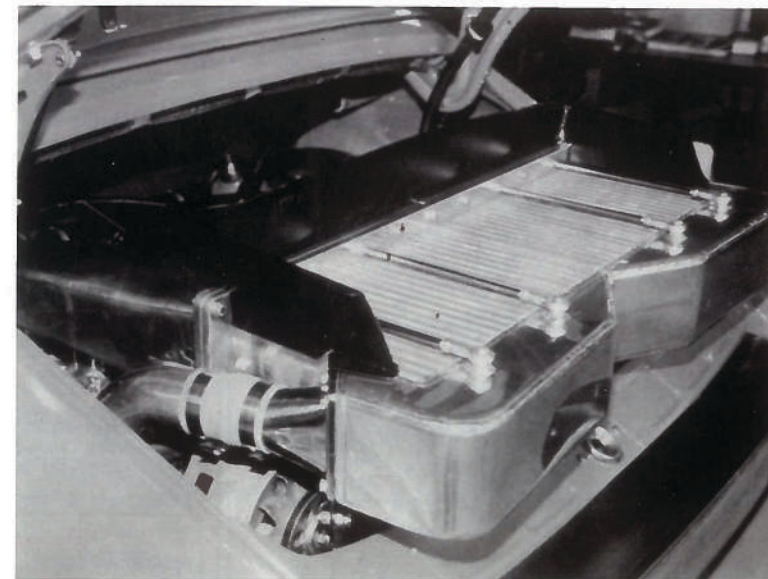
would surely be good enough for trucks too and, since there are a lot more trucks than there are Porsches, they started designing custom aerodynamic body kits for Kenworth and Peterbilt trucks. While they couldn't do slope nose conversions to the trucks, they could clean up the aerodynamics using side skirts, wheel covers, flush-mounted headlamps and smooth bumpers which greatly improve their appearance and fuel economy. These kits have been so successful that the truck manufacturers themselves have used Canepa to redesign their trucks. Canepa says that he and his employees are all really car guys and that they just treat the trucks like big cars — they just take up a little more room. He says that they have added a level of quality and finish that truckers are not used to seeing.

Canepa Design has always done restorations on Porsches and in the late 1980s they were fortunate to have a customer that wanted a 935 and a 936 restored which really allowed them to hone their restoration skills. One of the latest restorations from Canepa Design is an extensive renewal of a 906 that was little more than a valid set of serial numbers when they started and took nearly 4000 hours to complete. This car turned out really well, winning the Santa Barbara concours, and has been featured in several magazine articles.

Canepa has had his own Porsches since he was a teenager, starting with a 1968 911L that his dad, a car dealer, took in on trade. Canepa bought his first new Porsche in 1970 and wrecked it in the rain finding out how fast he could go around corners. He drove a 911R to college that he bought from Dick Smothers. Today he has an RSR, a 934, 935 and 959S. He raced the 934 and 935 back when they were contemporary race cars, placing third with Rick Mears in 1979 at the Daytona 24 Hours. Canepa also had one of the Holbert-built 962s which he restored, raced and then sold. The 962 was really one of the things that led to the building of this hot rod Speedster. The 962 had a spare engine that was worn out and a good candidate for detuning for use in a street application.

Setting the design goals

The 962-powered 911 Speedster that Canepa Design just finished belongs to Gary Primm, a casino



The very full engine compartment of the 962-powered Speedster. Most of the engine accessories had to be relocated because the engine faces the opposite direction in the 911 chassis.

owner in Las Vegas. Primm is a car guy with a large collection, but he was not a Porsche enthusiast and when he bought the Speedster he was disappointed with the performance and quickly became bored with it (the car had less than 100 miles on it when he turned it over to Canepa for its transformation).

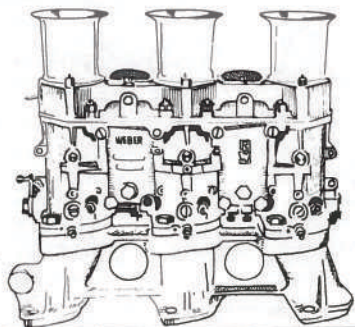
Primm and Canepa sat down about a year ago and talked about what the car could and should be like when the conversion was complete. Canepa felt that since all U.S. Speedsters had the turbo-look bodywork and suspension, they should have been turbocharged. He thought that the performance should be like a modern update of the old Carrera four-cam Speedster, a car that was great fun to drive in its day. Canepa's idea was to scale that sort of performance and fun up to contemporary levels of performance.

Canepa had the spare 962 engine that he knew could be made over into a wonderful street car motor. He told Primm that they could change the whole car into something that would be exciting and an incredibly fun street car. It would have a lot of power, it would handle, it would stop, it would ride well and have a stiff chassis, but not be too stiff in terms of the ride. Primm said go.

Originally the plan was for the car to look stock except for a large DP (Design Plastic) rear wing, but Canepa decided he would need larger wheels and tires for the car's potential performance envelope than would fit under the stock bodywork, so his concept for the car changed. Canepa likes the looks of the 934 and adapted some of its design characteristics to the Speedster. He says he likes the design because it maintains the Porsche tradition, but I

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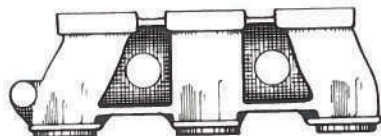
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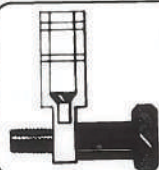
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suspect that it was as much because he has a 934 himself and likes the car as anything else.

In any case, they decided to use the 934 fender flares and the 934 front spoiler. A DP rear wing was chosen because something larger than the original 934 unit was needed: the huge intercooler of the 962 engine had to fit under the wing and they also wanted to keep the air conditioner which required wing space for the condenser.

Goals for the car were that it be very, very fast while retaining all of the comfort features of a street Porsche. One objective was to have at least 500 horsepower and another was to have a top speed in excess of 200 miles per hour. Because of the speed potential, they installed a low profile roll bar for safety. The roll bar is tied into a side bar structure that is tied in from the back of the car all the way to the front tower assembly for chassis rigidity.

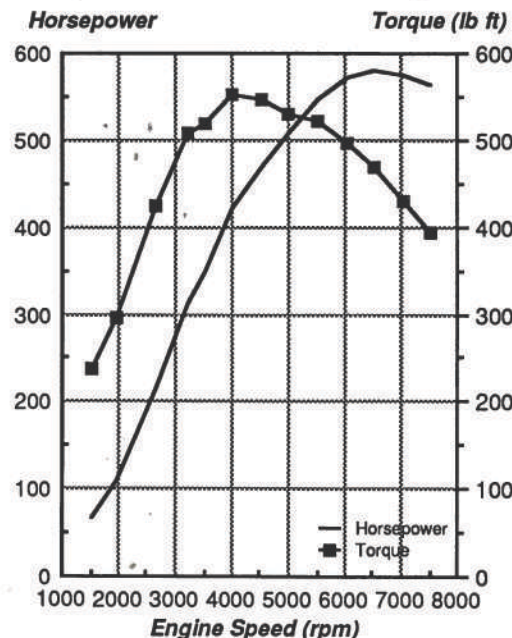
They felt it was necessary to stiffen the chassis because the stock 911 Speedster is a fairly flexible car. The target was a chassis as rigid as a coupe's so that the suspension could work properly. In addition to the roll bar and side stiffening bars, the chassis was also reinforced by boxing in the rocker box area and developing an extra monocoque substructure, raising the floor level from the seats back to get some additional strength in that area. The result is a very stiff "tub." For an open car it is very impressive; they couldn't have asked for more without putting a roof on the car.

In order to use center lock wheels, 935 center lock hubs and nuts were chosen, along with new BBS GTP wheels, 9.5-inches wide in front and 12.75-inches wide at the rear. BBS designed the new wheel because they needed more strength for the slide loads of GTP cars. The new wheel is a cleaner design with bigger spokes than the older style BBS wheel. Tires are the new Goodyear GSC 275/40ZR17 in front and 315/35ZR17 in the rear. According to Canepa, a set of BBS racing wheel fans will be trimmed and fitted before the car is delivered to Primm.

Torsion bar suspension

The original plan was to use a coil-over suspension. Canepa says that although coil-over suspension works fine for race cars, it is not the right compromise for a street car. In the middle of the Speedster project, Canepa Design had the opportunity to do a Porsche Club car for both street and track use and discovered that when they chose a coil-over spring rate that would work well for the handling, it was too stiff for a good quality ride. They did a lot of testing of spring rates and found they could make a car handle well and ride well on very smooth roads, but the

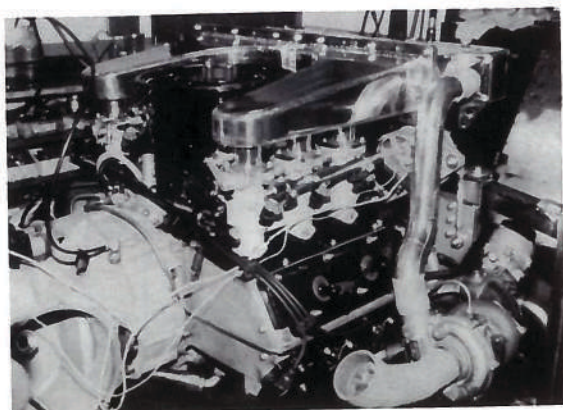
Speedster 962 engine



Jerry Woods designed camshafts for the Speedster engine to lower the power band and make the car more drivable. The goal was to maintain as much of the 962's power as possible while make the car pleasant to drive on the street.

fact is that there aren't that many smooth roads left anymore and the car just plain rode horribly. When they softened the spring rates enough to get acceptable ride quality, the handling went away. Canepa feels that this is because of changing where the load is transmitted into the car's chassis from where the loads were absorbed from the torsion bars.

As a result of that testing, they decided for the Speedster they would not use coil-over springs, but instead chose torsion bars because they work well on all pavement conditions, providing a good ride and handling that will allow you to take a corner as fast as your fear level will allow. In fact, the whole chassis and suspension plans for the Speedster were based on their experience with other cars they'd built. They used rifle-drilled torsion bars made by Stevens Machining, 33 mm diameter in the rear and 23 mm in the front. The front and rear swaybars are 22 mm "Charlie Bars" by Wrightwood Racing. The shock absorbers are custom-valved Bilsteins. Canepa says that the Speedster handles better than any street Porsche that he has ever driven. He believes it actually handles as well as his RSR, except for the fact that it does not have racing slicks on it. It is the only street Porsche that he feels handles as well as the 959.



The 962 engine mounted on Jerry Woods Enterprises' dynamometer. Modified for street drivability, it delivers 581.5 horsepower at 6500 rpm and a peak torque of 550 footpounds at 4000 rpm.

The oil system is designed like a racing Porsche with the oil tank in the front trunk. The system holds 28 quarts of oil. The engine breather "breathes" into an accumulator tank back in the rear fender well. The accumulator separates oil from the oil fumes and pumps the oil back to the tank, allowing the fumes to breathe into the oil tank under the front hood like Porsche racing cars.

The brakes are the big Brembo calipers like the ones used on the 959 or 928 GTS with 935 rotors mounted to the 935 hubs. They didn't want to give up the power brakes, so they designed and fabricated a vacuum storage tank using the 962 engine for the vacuum source. They were able to combine the comfort of power brakes with the stopping power of a race car.

Almost everything in the car had to be moved around or changed somehow to make all of this work. For example, they chose to use rear ducts similar to those used on the 959 because they were attractive and functional. The ducts are used for the inlet air to the turbos. A hose goes up from the duct back over the wheel wells to the rear of the fender up by the taillight where there is a K&N filter in a canister on each side. From the air filter canister there is a tube that rolls right down into the turbocharger inlet.

The G-50 five-speed from the 1989 911 Turbo was selected, but Canepa shortened it by an inch so that it would fit into the Speedster chassis. The axles and CV joints are made by Super Boots, the company that makes Indy car axles.

Converting the 962 engine

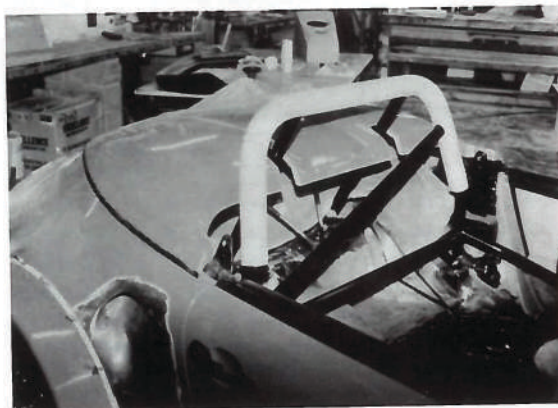
The spare motor from Canepa's 962 was a good starting point for the Speedster hot rod. Canepa espe-

cially wanted to use an engine with a flat fan because of its better cooling. He also likes the flat fan for esthetics and because, as he says, it sounds so neat.

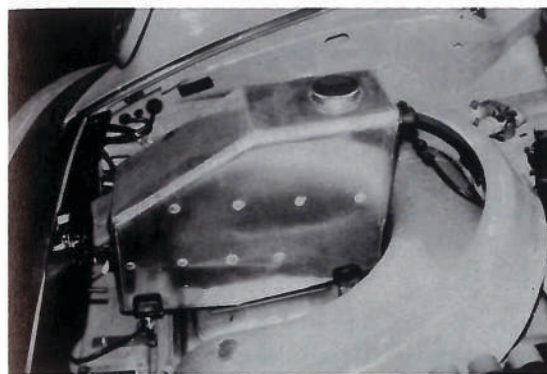
They got together with Jerry Woods, who Canepa feels is the best Porsche motor guy around. They talked about building a street motor with a lot of torque, a lot of bottom end power and as little lag as possible. It would have to be something that could be driven all around town and then go as fast as a race car on the freeway. That is exactly what they ended up with: a 600 hp motor (actually 581.5) that you only have to turn up to 6500 rpm. Canepa says that it can literally fry the tires in the first three gears if you aren't careful and that is with the 13-inch wide sticky Goodyears. On the freeway at 2000 rpm he says that it accelerates like a 450 cubic inch V8. Well, it should, with the torque curve that this engine produces. At 2000 rpm the engine produces over 300 ft lbs torque and from 2500 to 7500 rpm it delivers in excess of 400 ft lbs with a peak torque of 550 at 4000 rpm (see chart). The engine performance was measured with all accessories in place, including the muffler.

The turbo lag is well below 1500 rpm. Canepa says that he cruised all around town for a couple of hours one day just to see what it was like and how it would perform — it is smooth. Jerry Woods converted the 962 engine to 3.5 liters by using 100 mm pistons and cylinders with the 74.4 mm stroke crankshaft. He chose to use HKS electronic wastegate control with two preset positions and a variable position instead of the manual valve traditionally used on turbocharged Porsches.

Woods used a programmable twin ignition system that he has developed himself and a prototype of a new Haltech fuel injection management system. The



A low-profile roll bar for safety is tied into a side bar structure that is tied in from the back of the car all the way to the front tower assembly for chassis rigidity.



The oil system is designed like a racing Porsche with the oil tank in the front trunk. Canepa Design fabricated an oil tank which fits in the relief in the gas tank for the spare tire.

Haltech system takes advantage of the existing 962 intake manifolds which used twin staged injectors. The engine runs on one set of injectors while it is running normally aspirated and the second set of injectors is phased in when the engine comes up onto the boost. This staged injection system provides better control over the fuel mixture under all operating conditions so that the car runs better as a street car.

Canepa and company had to design and build their own exhaust system to do what they wanted to do and fit everything into the car where they wanted it with the twin turbos and all. Originally they hoped to use one of the stainless steel systems that are on the market, but it just wouldn't work for their application. Making their own gave them the opportunity to put the turbos behind the rear tires alongside the motor, which allowed them to keep the primary header pipes short for better performance. Their turbo placement also gave them a straight shot up through the car to connect to the large intercooler. By keeping all of the plumbing short, they were able to cut the turbo lag considerably. The turbos that they used were the original K26 turbos that came on Canepa's 959S. The turbochargers are sized for low end or overall performance and drivability rather than peak power as would be the case with an engine used for racing.

Shoehorning it all into place

Most of the engine accessories had to be relocated because the 962 is a mid-engined car and the engine faces the opposite direction from what it does in the 1989 Speedster. Fred Garretson supplied the large intercooler core for the engine conversion. Canepa Design built their own intake plenums and intercooler plumbing so it would all fit under the DP rear wing and engine lid. Everything was designed to be

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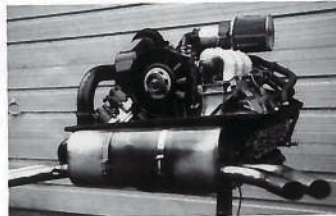


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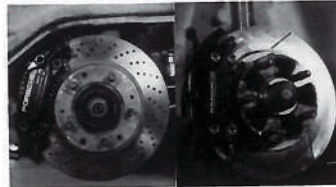
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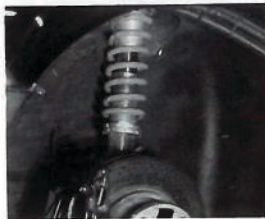
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functional and look good when you open the engine lid. They wanted to be able to use all of the standard engine lid mounting and latching hardware. They built the rear motor mount plate so the air conditioner compressor could be mounted on the back side of the motor plate where there was still some room, specifying a reverse direction compressor that would work facing backwards in the car. They built their own stainless steel muffler with two large rear outlets to look like the tail pipes on the twin-turbo 935 engines. The muffler kills most of the noise, but the car still sounds great.

With no room on the headers for heater boxes, they developed their own heater system, choosing the gas heater that Porsche uses in their rally cars. The heater works well and will allow the owner to warm the Speedster up on a cold day in the desert area of Las Vegas.

It was also necessary to design an emergency brake system because with the 935 brakes they didn't have an emergency brake. They created a system that uses an Accumulock to apply pressure to all four calipers when it is in use. To apply the emergency brake, you pump the brake pedal and hold up the

lever on the Accumulock and it sets all four brakes. When the brake is set, it will safely hold the car on a hill; park the car on a hill and it isn't going to go anywhere.

Canepa Design put in a good set of TRW four-point competition belts. They put a slot in the headrest so that the shoulder belts can come through the seat from the correct height for safety, very much like the new sport seats for the Carrera Cup cars from Porsche do.

I asked Canepa how fast the car was and he said he wasn't really sure because he hadn't had it flat out. He has had it up to 7200 rpm in fifth gear which Jerry Woods calculated to be 202 mph with the gear ratios and the tire sizes they were using. (The car uses a 959 speedometer, but the 959 has different gear ratios, so it is not accurate for the Speedster and read only 190 mph at 7200 rpm.) He said that at 200 mph the car feels pretty comfortable. It is noisier than anything that he has driven before because it is an open car, but otherwise it feels fine. The car is geared to go over 210 mph and should have plenty of power to pull the gearing. ☺

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