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THE NEXT 911:

Porsche's 959 points the way



*An in-depth look at the next evolution of the 911,
in road-going and Paris-Dakar trim*

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REJOICE, PORSCHE 911 fans. I've worked a time warp and can report that there's a rear-mounted flat-6 future. What's more, Zuffenhausen products of 1990 or so will have enough technical niceties to carry them competently through that decade and into the next century.

These futurist concepts are already here for examination, embodied in a couple of cars that have occasionally been seen outside of Weissach. The first of these, the Gruppe B, was the pearlescent star of the 1983 Frankfurt show. A second iteration, now carrying the nomenclature 959, was photographed in private testing at Hockenheim. Not to be outdone by this feat of photographic spy work, I later crawled in, around and under the 959 rally variant during its Weissach prepping for the Paris-Da-

kar run, said crawling ably directed by Roland Kussmaul, Porsche's team manager for the project.

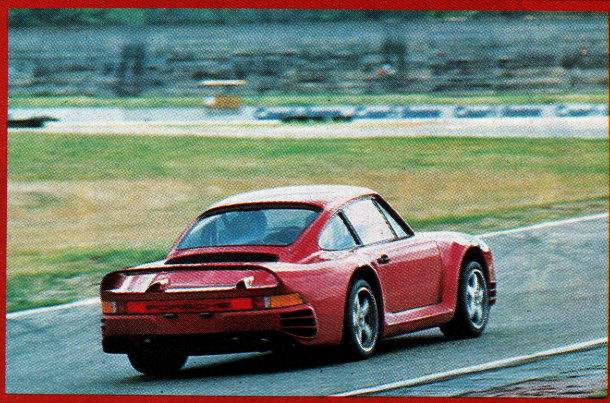
While it's evidently premature to identify specifics of the next 911, this much is clear: It is far from the end of its evolution, either as a road-going car or in competition trim. Follow along through details I've gleaned of the road-going 959 and its Paris-Dakar sibling, and you'll recognize the car for which future PCA members are going to be lusting.

By the way, if their lust runs only skin deep, it can be satisfied in fairly short order: Through arrangements that have no factory connections per se, fiberglass copies of the 959's stunning bodywork are expected to be available via several channels.

The real thing, though, is decidedly more exotic. Most of the

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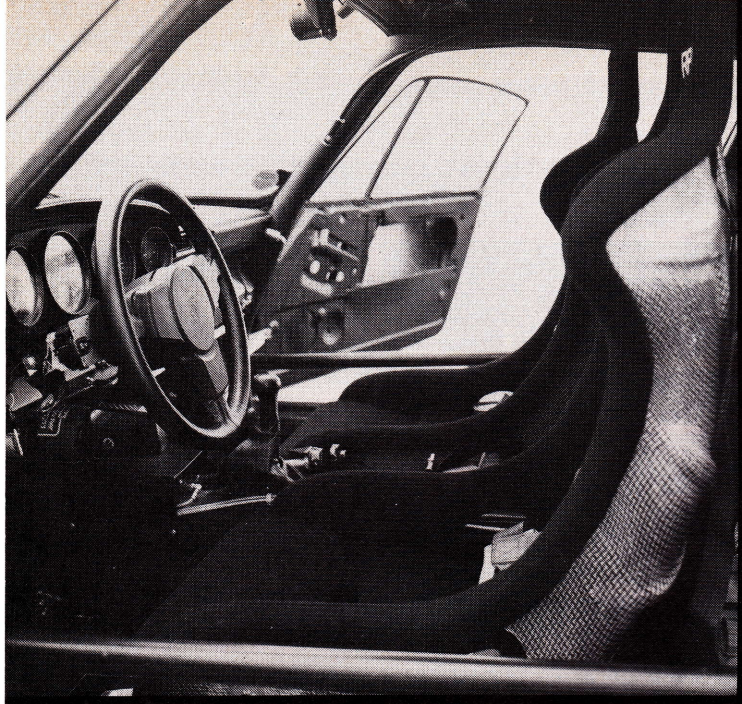
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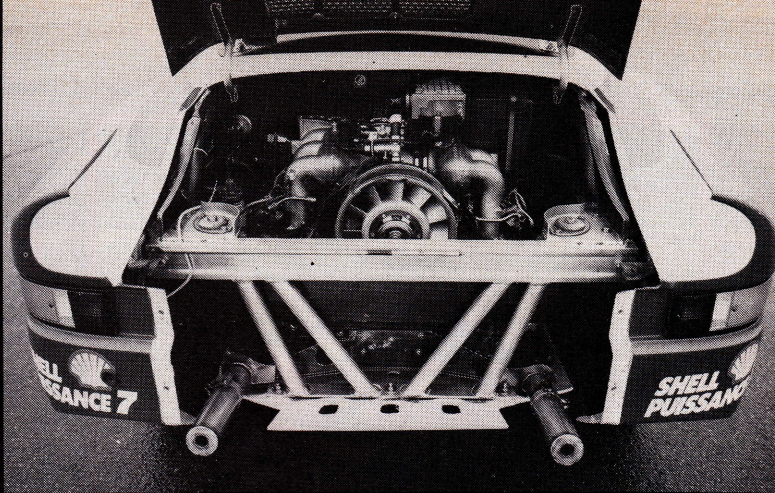
Production 959, as seen in private testing at Hockenheim: 911 heritage is evident in the cab, but the rest of its Kevlar shape is new. Dunlop Denloc tires, tall with ultra low profile, have run-flat capability and built-in inflation pressure sensing.

THE 959





PHOTOS BY KLAUS REICHERT



Tame 3.2-liter Carrera engine reflects fuel quality along Paris-Dakar route. Robust tubing supports belly pan that can (and occasionally does!) support weight of entire car.

Interior of Paris-Dakar variant is a mix of race car and various production Porsches. In contrast to road-going 959, controls are non-assisted and non-electronic.

body panels are Kevlar, an aramid composite of exceptional strength and lightness; half the weight of aluminum, notes Kussmaul. Distinct hints of 911 styling can be observed, especially through the central cab, though even the roof is of this lightweight material. The only portions of the steel unibody retained from the 911 are its A-pillar and windshield frame, its adjacent dashboard bulkhead and dual floor pans. There's a new central cockpit tunnel of steel, through which the front driveshaft heads forward. Also, steel box sections are added longitudinally outboard of each floor pan; this, to enhance torsional rigidity of the chassis. The trunk lid and doors are aluminum, but the other body panels, even the rear deck with its integrated wing, are Kevlar.

The 959's organic contours suggest hours of wind-tunnel testing, though the most interesting bodywork is actually beneath: a full belly pan and side tunnels whose downforce-generating geometry comes from Porsche's 956 Group C racer. Nor does the downforce come at a great expense of drag, what with a C_x of 0.30 being claimed for the latest version of the 959.

The rally car's bodywork is essentially the same, but for several vagaries of the Paris-Dakar. The rear fender flares were a bit too wide for the regulations, and they've been reduced by 10 mm per side. Also, I noted a particularly healthy bracket of tubular stock being added at the lower rear. "The belly pan mounts to that," explains Kussmaul, "and on the rally car this central pan is strong enough to support the entire weight of the car." The standard 959's tunnels and belly pan are of 0.12-in. Kevlar, whereas the rally car's central pan is 0.39 in. thick. "That's for passing over rocks," says Kussmaul, a bit too nonchalantly for my taste. And I was to learn a lot more about the rigors of Paris-Dakar before my visit was over.

The engine compartment of the rally car reflects this, for instance. Within lurks a normally aspirated 3.2-liter powerplant, essentially the one powering the U.S. Carrera. Why? "It is because of fuel," explains Kussmaul. "There are actually two problems," he continues. "First, do you have fuel or not? And, second, the octane."

The longest stage in this year's event is some 590 miles, and while the regulations don't limit the fuel capacity, there's only so much that'll fit. Kussmaul cites fuel consumption a la aircraft terminology, around 7.9 gal./hr for running at an average 62 mph. He sums it up, "As you can see, the 959 is not the biggest car. And, unfortunately, more horsepower means more petrol." Thus, the optional solution for Paris-Dakar's 8700 miles is a relatively detuned, normally aspirated powerplant.

Octane has its impact as well. In parts of Mali, for instance, the best available fuel is around 84-85 Research Octane Number; this, compared with the European 3.2-liter's usual appetite for 96 RON. Porsche's response is to drop the compression ratio from the European 10.3:1 to 9.5:1. Not much of a decrease, actually, but Kussmaul observes that the combustion chamber geometry of this design has proved to be quite ping-resistant.

In Paris-Dakar trim, the engine produces 230 bhp DIN at 6000 rpm and 207 lb-ft of torque at 5000. "We lost perhaps 20 bhp with the lower compression ratio," observes Kussmaul. "But we have an open exhaust and polished ports, and we found it again."

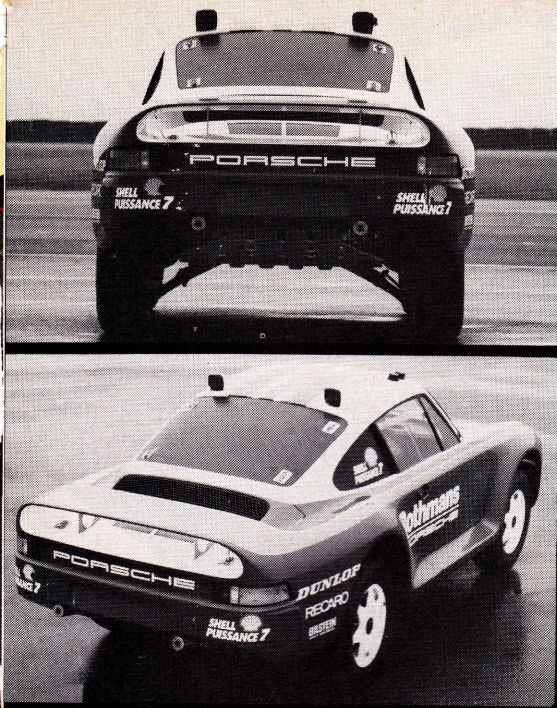
Whereas the Paris-Dakar engine can trace its heritage, more or less, to Beverly Hills, the standard 959's owes its technicalities to Sarthe. This 2.9-liter twin-turbo boxer follows design parameters of Porsche's 3-time World Endurance Championship-winning 956. It has dual overhead camshafts per bank, four valves per cylinder and mixed-mode cooling, with the cylinders deriving theirs from air and the heads by water. Unlike the 956, by the way, the 959 has heads cast in triples; the 956 uses separate castings for each cylinder barrel.

This is Porsche's first non-racer with water-cooled heads (please, no letters: I mean heads alone being so cooled); enhanced thermal efficiency being the reason. But Kussmaul jokes about an entirely different sort of thermal efficiency: "These heads make the heater much easier to control. With the 911, a lot of revs means a lot of heat, and you're always working the adjustment lever."

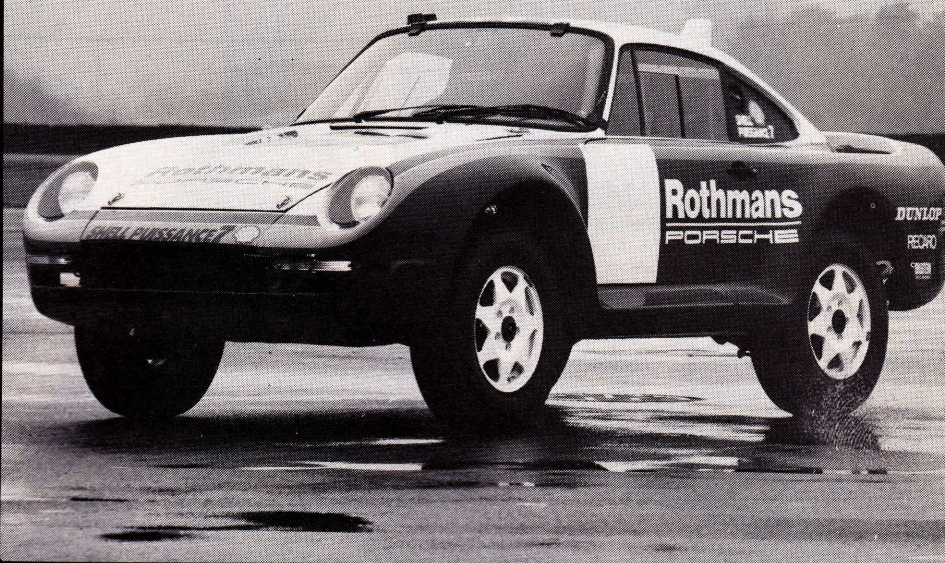
The engine's fuel injection is under the control of electronics, in a system not unlike that of the TAG Porsche Formula 1 powerplant (R&T, February 1985). By contrast, hydraulic valve lifters are fitted in the interests of noise and maintenance. And, surprise, this ultimate of Porsches for the road even has the potential for being ultimately clean: Twin catalytic converters are part of the design concept and Porsche officials observe that the 959 can meet current EEC exhaust emission limits.

Not completely as an aside, I saw the first of Germany's *Bleifrei* (lead-free) gasoline pumps during my visit. They were not overly crowded. On the other hand, many Germans with whom I spoke are convinced that *Katalysatoren* are coming and clearly Porsche is at the forefront of converter technology. In fact, emissions controls of the 959 were referred to as second generation in their optimal tradeoff of power and emissions.

Twin KKK turbochargers are part of this equation, as are twin water-to-air intercoolers nestled in the car's rear flanks. The in-



Rally car's high-rider appearance hints at expected condition of roads (or lack thereof).



tercoolers share their water supply with the cylinder heads as it passes from a nose-mounted radiator. Also fitted up there is an oil cooler. And if your eyes are sharp, you'll notice the Hockenheim car shown here exhibits changes in its ducting compared with the original Gruppe B design.

Output of the road-going 959 is an estimated 450 bhp. And, based on 956 ratings, it's not unlikely that a full-race 959 could have more than 700 bhp with which to contend. Getting all this power to the road is perhaps the most interesting of the 959's considerable list of features.

Think of the road-going 959 as Porsche's second iteration of 4-wheel drive. The first made its debut in the 4wd Cabrio shown at the 1981 Frankfurt show (R&T, December 1981). Later, a 911 fitted with this system took top honors in the 1984 Paris-Dakar. What characterizes this 4wd is constant torque split, typically set at 40/60, front/rear, to correspond with the car's weight distribution. By contrast, the 959's 4wd system has variable torque split and, what's more, it's continuously variable under electronic control.

Power passes through a 6-speed gearbox, with speeds in gears of 27, 50, 68, 93, 118 and 136 mph using the evidently short Paris-Dakar final drives. Then it goes forward to a central differential whose fore/aft split is determined by internal clutches. Fully disengaged, they leave the 959 in essentially rwd mode; full on, and the car carries a 50/50 split of torque, front/rear. Intermediate settings do just what you might expect.

The Paris-Dakar setup is similar, but it dispenses with electronic control in the interest of extreme robustness. "In the rally," notes Kussmaul (in a growing collection of wonderful understatements), "it's possible to crash and still continue. Maybe the electronics won't survive this crash . . ." At any rate, the rally car's 4wd has two manual controls, a T-bar between the seats controlling the locking/unlocking of the rear differential and a large knurled knob adjacent to it that sets the central torque split. A dash-mounted gauge reads 0 (full rwd) to 10 (4wd with a 50/50 split).

How would these controls be used? "Typically," says Kussmaul, "you run with the rear differential unlocked, unless you are stuck in deep sand, for example. As for torque splitting, it depends on how you want the car to handle. If speed is low and the road is twisty, you want lots of power to the rear wheels for oversteer; thus, mostly rwd. At top speed, the 50/50 split gives understeer and the best directional stability."

Would you ever want full rwd? "Only if something breaks up front," says Kussmaul. "During practice, the drivers try full rwd

to simulate what would happen if the car destroys a front halfshaft. They come back with bald rear tires and sweaty driving suits." One set of tires may last 3000 miles with a normal torque split; go to rwd, and they're gone in less than 500 miles.

The road-going 959 takes rather better care of its tires, what with electronic control of torque. What's more, the logic invokes an anti-slip strategy based on information from wheel sensors at each corner of the car. If a rear wheel breaks loose, for instance, the central electronics automatically transfers more torque to the front.

I asked whether it was possible to apply automatic power reduction in response to wheelspin, a la Volvo's concept. With the latter, its electronics turned down turbo boost and even decreased fuel flow if wheel sensors identified that the rears were spinning quicker than the fronts.

"That's the problem," responds Kussmaul. "The Volvo is rwd, so you have a pair of undriven wheels to tell true speed. With 4wd, it's difficult to tell whether all four wheels have lost traction or just that the car is going quicker."

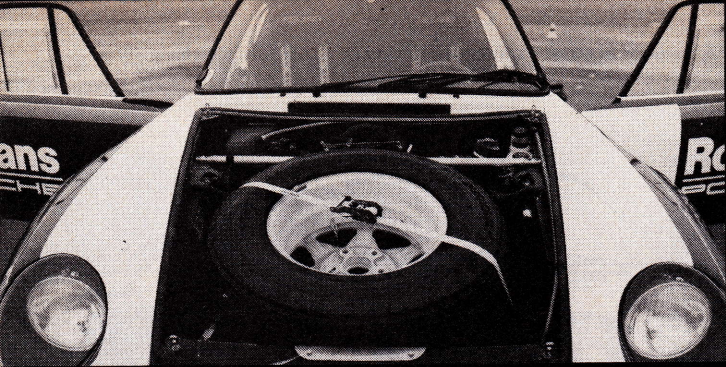
"On the other hand," he reflects, "the logic could be set to expect only so much difference in speed in a short time . . ."

This same rotational intelligence is used in the road-going 959's braking department via ABS. The rally variant, however, does without again. In fact, its braking system is unboosted as well, though it does have cockpit adjustability of its dual hydraulics for fore/aft balance. "Also, in case a brake line is destroyed," says Kussmaul.

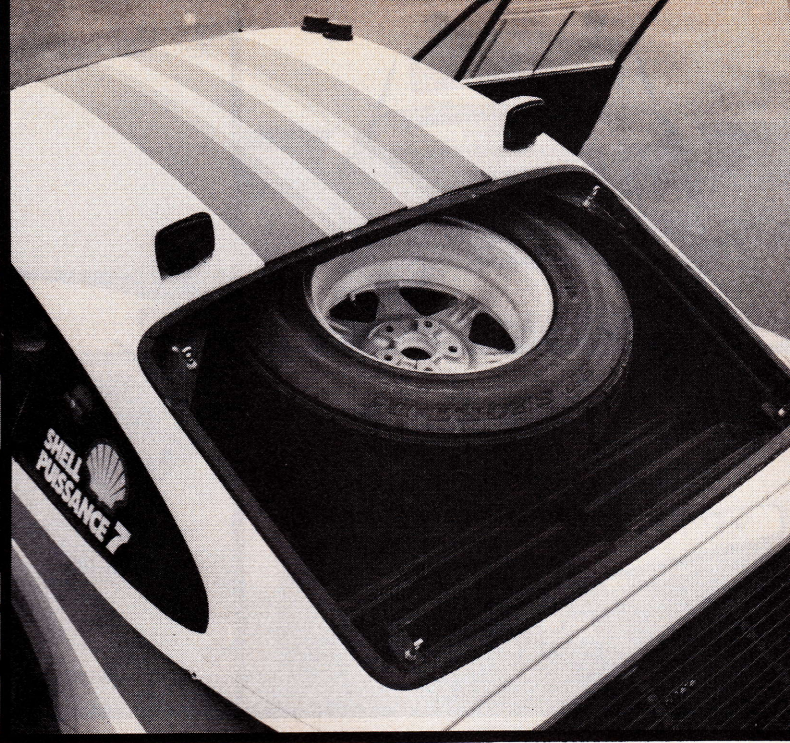
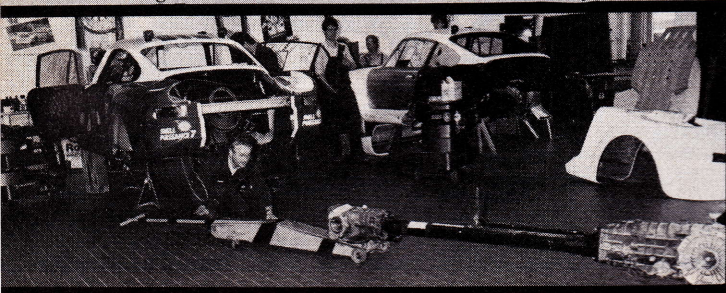
Brakes of the standard 959 come directly from the appropriate corners of the company's 956 Group C car, huge cross-drilled radially ventilated discs. The rally variant uses only the smaller rear discs all around. Why? "It is important," says Kussmaul, "to limit the number of different spare parts that must be carried by the support vehicles. With the same discs, the calipers are also the same."

Suspension of either version traces its heritage to race car practice, with unequal-length A-arms and anti-roll bars front and rear. A pair of coil-over units reside at each front corner; dual shocks are at each rear position, but only one per side is wrapped with a coil spring. As with race cars, everything is adjustable via multiple pickup points. But unlike any race car since the Formula 1 ground-clearance fiasco, the road-going 959 also has self-leveling, variable spring rates and adjustable shock absorber settings, all under dual electronic/driver control.

An air spring at each corner varies the ride height and spring rate. Specially designed Bilstein shock absorbers offer a positive ➡



Rally car's trunk and rear area house fuel tanks, spare tires and little else; fuel can be pumped fore or aft as ballast to help handling. Below, drivetrain gets installed in immaculate Weissach assembly area.



overkill of damper settings in both jounce and rebound (unlike most adjustable shocks that vary only the latter).

The driver has the last word, with a manual override choice of soft, medium or firm. And once underway the car itself can get into the act: Up to around 30 mph, its electronics select the soft mode. From there to just beyond 100 mph, the system increases firmness progressively through some 11 gradations. Beyond 110 mph, the firmest setting is invoked.

Once more, the rally version does away with all this electronic wonder. "Accident survivability," observes Kussmaul.

There is, however, another novel means of influencing the rally 959's handling: Two valves down between the seats control fuel flow to and from the front- and rear-mounted tanks, of 26.4 and 47.6 gal., respectively. The primary reason for return lines is to route excess fuel from the injection system, but they can be exploited in other ways as well. "If one tank develops a leak," explains Kussmaul, "it's possible to pump fuel into the other tank and seal off the first one. Also, pumping fuel into the forward tank moves weight forward and promotes understeer; vice versa for the rear one and oversteer."

Steering is a rare feature of the 959 not probing the absolute limits of automotive engineering: It's a standard Porsche rack-and-pinion system on either road-going or rally version.

On the other hand, innovation returns with the subject of wheels and tires. "The street version uses Dunlop Denloc tires," notes Kussmaul, "designed to stay on the rims even if they blow out at high speed. The problem is, if a normal tire blows, it damages the bodywork. But we've tested these to 400 km/h [248 mph] and they work. They allow you to come down safely from speed, important in a car capable of 300 km/h [186 mph]."

There are also sensors at the wheels monitoring inflation pressure. In fact, the wheels have hollow spokes so that an incipient failure of one of these components would set off an alarm as well. Dashboard warning lights identify not only the low pressure, but also which tire/wheel assembly is the culprit.

The road-going 959 rolls on tires of quite different widths, 235/40VR-17s and 255/40VR-17s, front and rear, respectively. To avoid the complication of carrying two different sizes, though, the rally version runs on one alone, Dunlop 205HR-16s mounted on 16 x 6 rims. "These are special tires," notes Kussmaul. "Their relatively small negative area [i.e., the open space between the tread pattern] is good for sand and stones. There are other surfaces, however, where they're not so good. Through the Ivory Coast, we prefer a wider, softer tire with more negative area. But we have room for only 40 tires total, so we

must choose carefully."

Is it a disadvantage to run the same size tire front and rear? "Yes, it is a compromise," explains Kussmaul, "but necessary to limit the number of different spare parts. So maybe we give away a little during the early parts in Africa, where there are lots of left, right, left, right. But our big advantage comes in the desert, where our power, aerodynamics and top speed become important. Last year, we were 1st in the desert section by one hour; and we won the rally by one hour."

Herr Kussmaul and I continue chatting about the Paris-Dakar: How does it compare with the East African Safari Rally, for example? "They're both very difficult," he observes, "but remember the extreme length of the Paris-Dakar. The Safari is more of a sprint."

"Support is a real problem in the Paris-Dakar," Kussmaul continues. "Last year, I followed Jacky Ickx in another 4wd 911 loaded with spares, but there simply wasn't enough room. This year, I follow in a Mercedes."

He'll use a 4wd G-Wagon, specially fitted with lightweight fiberglass bodywork and a modified powerplant. "But it will still weigh 2200 kilos and have less than 90 bhp," laments Kussmaul. "If all goes as planned, I'll see the rally cars for two seconds at the start only. But if they break," he continues, "they're lucky to break soon. Otherwise, it could be seven to eight hours before help arrives."

Whom does he see as the competition? "Audi, Opel and Mitsubishi," Kussmaul answers, "and Lada." Lada? Somehow I couldn't imagine these stodgy Russians being all that impressive. "But these are special," notes Kussmaul, "done by Lada of France. Last year, the only original thing was their styling. The body was plastic, beneath it a tube frame, a 280-bhp Chrysler engine, a Renault gearbox—and Porsche original equipment wheels."

We conclude our day by musing once more about the 959. At latest estimate, it's not expected to appear in selected Porsche showrooms until early 1986. And then any one of them won't stay very long because the entire production of 200, required of Group B regulations, is already accounted for. Three trim levels are to be built: a luxurious version, a roadable racer and an out-and-out competition variant. Prices start at 398,000 Deutsche Mark, about \$125,000.

I ask Kussmaul if he plans to use his influence to buy one for himself. "I think it's a present after the rally," he says. And I can see that Herr Kussmaul wouldn't mind at all being the first on his block to own this future 911.