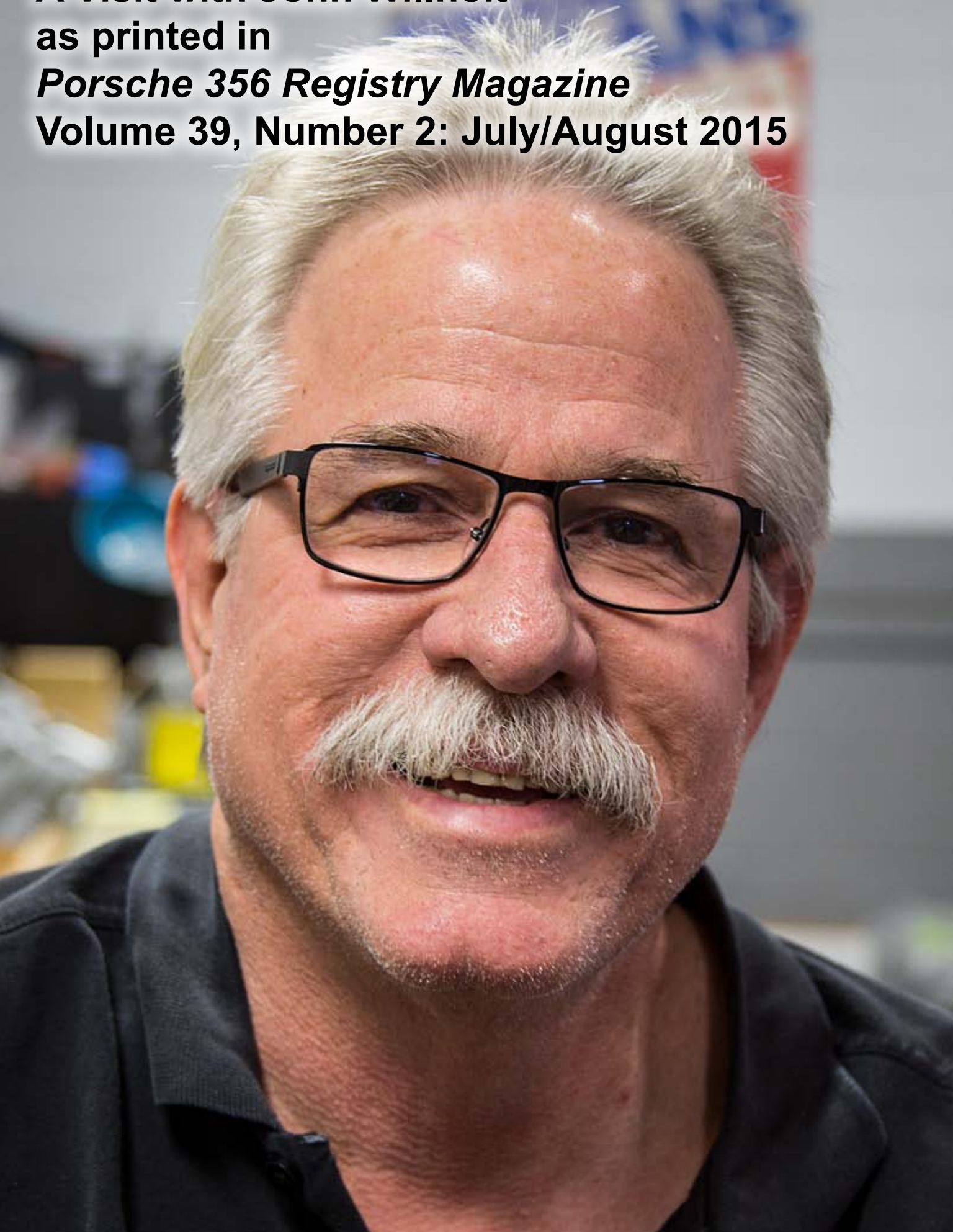


**A Visit with John Willhoit  
as printed in  
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Volume 39, Number 2: July/August 2015**





# Porsche 356 Registry



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## Porsche 356 Registry



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Cover: On the top of Novena Pass, Switzerland (2,478 m).  
Loris Gianotti

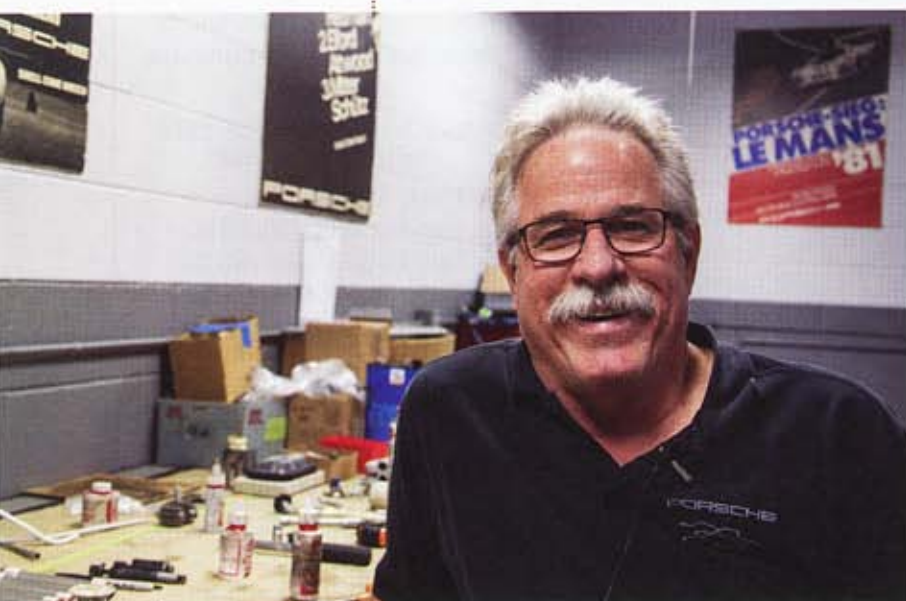
This page: The view towards Bellevue, WA from the New-castle Golf Course.  
Nick Daffern



A Visit with

# John Willhoit

**W**hen I first pulled into Willhoit Auto Restoration in early February, its owner was off running errands, giving me an opportunity to cruise around his shop and check things out alone. Clean, efficient, it holds up to F1 standards. Benches well organized, floors shined, customer cars are all sparkling and well-spaced, it's a workman's dream. I already had a feeling for the man I'd be spending the next three hours in conversation with: quiet, laid back, but with deliberate motion balanced by a deeply inquisitive mind and an obsessive drive for detail; that's John Willhoit.



Story and  
photos by  
Sean  
Cridland

A life-long native of Long Beach, Willhoit's dad was a car-guy, but of a different ilk. He chuckles a bit when describing his dad painting an old Rolls Royce with Krylon in the driveway of their home on a day when his mom was having her bridge club over. Though his dad was into exotics – Rolls, Bentley, Ferrari, Lamborghini – he didn't really see the point of deep restoration on the level done today. It was more buy and fix just enough to flip... spray-cans, staples, and chewing gum. It was in that same family driveway that Willhoit started working on cars, even before he was a teenager. His first car was a 1959 Alfa Romeo Giulietta Spyder that he bought for \$500, and yes, they painted that car in the driveway too.

That Alfa led Willhoit to his involvement with Porsches. He used to drive it to high school golf team practice and noticed that the manager of the golf club drove a very nice 1957 356 coupe. After getting a ride in that car, he had to have one. Two years later, in 1971, he offered \$900 to a local dealer for a 1961 T5 61 Super 90 Cabriolet with a hard top. The notchback look of the car had kept it on a local dealer's lot for too long. Though it took a few tries, they eventually accepted. It was a good deal for Willhoit, especially since they had recently rebuilt the engine.

By that time his dad had an actual spray-rig for painting... which they still used in the driveway. A family friend did the upholstery work. Willhoit remembers thinking that it looked great, but by his now matured standards figures it was probably hideous. It couldn't have been too bad. Six months later he was offered \$1500 and took it. That, along with his education at USC got him started in the car business.

The task for his Executive Decision Making class was to analyze a business for its profitability. There were no corporate businesses that excited him, so he decided to make up a business of buying and selling used Porsches. Rewarded with a good grade for his thorough analysis, he thought, "Maybe I could actually do this." Predictably, after graduation, most of his classmates went off to work in corporations. For Willhoit, it was a fate he could not bear: ties, haircuts, stuck in an office... no, it wasn't going to happen. Instead, he rented a little garage in his grandfather's former lumber yard for \$35/month. He decided to specialize in Porsche 356s only and – as he says – "it just got out of hand...."

In the beginning it was almost all paint and upholstery and some engine work. In the 1970s and early '80s the market was smaller and there were enough good cars to satisfy the market. No one bothered with rust work. As the market grew prices started to climb; there was enough demand to start repairing damaged or rusted cars. At first, factory floor pans were still available. Eventually, the aftermarket industry started developing and everyone started doing rust repair. Willhoit says he didn't put a floor pan in until 1988 or 1989.

While Willhoit Auto Restoration offers a complete line of services for building and restoring world-class cars, we will focus only on a few of their areas of expertise: engines, stabilizing chassis, and color sampling. First, the engines.

## Horsepower in the real world

Never mind originality, it's always the case that car people want more performance. Willhoit had a customer looking for more power in his Roadster. At the time, the industry standard for performance 356 engines was a 1720cc with 86mm pistons, a hot cam, either Webers or Solexes and a Bursch tuned exhaust. Some builders were claiming as much as 120 hp from such a unit. When Willhoit entered the performance market, his obsession for knowledge and detail took over. There would be no assumptions. If he was to build a hotter engine, he wanted real numbers. He built an engine emulating what was current for the market and took it to the dyno to see exactly where they were starting and what could be improved. He found the claims for engines like that were inflated by as much as 30 hp. Nonetheless, the experiment provided a good starting point for baseline data.

If you couldn't get large steps in performance from add-on parts like cams, carburetors, and exhausts, then something more fundamental would be required. Willhoit and his team looked at increasing displacement through bore and stroke. They also looked at the efficiency of the

burn in the combustion chamber vis-à-vis the shape of the piston, and the flow of intake and exhaust gases, and providing a secondary ignition by way of a twin-plug system.

The first step was to make something bigger. VW had a 90.5 cylinder kit that was popular and relatively cheap. So Willhoit bored a set out to 91mm and a machinist friend did the modifications to fit them on a 356 case. Then they bored the head and found there was just enough room to make everything fit without sacrificing structural soundness. They discovered that the highly domed shape of the piston required to get proper compression in the exhaust chamber blocked an efficient burn across the whole chamber during firing. That was the origin of the Willhoit twin-plug arrangement. Engineering and machining the heads for the twin-plug solution wasn't a problem, but finding a suitable distributor to carry the spark was.

With some research, Willhoit found that the 1980s era Nissan NAPZ 2400cc engine used a twin-plug arrangement to meet emissions standards. That meant a plentiful supply of inexpensive caps and rotors, though they would need to be adapted to suit the Porsche engine. He built a billet distributor and installed internals from a Mallory distributor adapted to the Nissan shaft. "The first one was a pain..." he says. Eventually, they took it to the dyno and it made a lot more power. With all the modifications they were able to get the 1720cc up to an honest 130 hp, though he says "below 3000 rpm it wasn't very happy." The next step was a 1925cc engine that worked out to be about 145 hp, provided more torque and balanced out some of the low rpm issues. That one went in a customer car and was driven a hard 1300 miles with no problems before it was torn down for study and lessons to be incorporated in the next stage of development. Soon afterwards he found a supplier that would build Willhoit proprietary carbide nikasil-like coated aluminum versions of the cast-iron VW cylinders he'd been using. Those were lighter and were more efficient for cooling. They look nice too.

Of course if you've worked out how to make a reliable 145 hp, someone will want more. Again, that meant an increase in displacement. Eventually Willhoit and his engineers learned that a lot of the VW hot rod guys used a Chevy rod-bearing to provide a longer stroke. There would be clearance issues in the case, unless... Willhoit figured he could have Carrillo make rods adapted to the Chevy bearing. That led to another proprietary element, a 77 mm crank. No case redesign would be needed. This arrangement brought displacement up to 2002 cc; only 77 cc bigger than the previous unit, but it made a big difference in both performance and drivability. Why? The longer stroke creates a different angle on the rod, with more side-load on the piston, effectively increasing torque. Willhoit built several engines like that with twin-plugs. One customer has almost 20,000 miles on his and it still runs great.

## The next step - backward

Inquiring minds like Willhoit's need to know, not guess, so he started to rethink the twin-plug project. He had discovered that as the displacement increased, the piston required less of a dome because you can run a bigger combustion chamber for the same compression ratio. He also learned to increase the sizes of the valves for better flow. Did they really need the costlier and more complicated twin-plug system?



Outlaw engines may make the news, but most Willhoit restorations are done with an eye toward authenticity and correct components, both in the body and the mechanical aspects. These engine cases await their internals, which have all been renewed or upgraded with the end result a proper-appearing and good running unit.





photos courtesy Willhoit Restoration

From left: In Willhoit's 2.1 engine an 82 mm crank and special Carrillo rods allows just enough clearance with the cam lobes. Wider cylinders required a new sealing solution to the specially-shaped combustion chamber with twin plugs. Durabar cylinders and short-skirt 3 ring pistons with a custom dome and exhaust valve pocket.

Not willing to rest on assumptions, Willhoit created a test rig on which he could run two plugs, but switch off one or the other of the plugs to gather performance data. He could test and develop settings for both single- and twin-plug engines with the same test unit. He found that twin-plug units required less ignition advance, but essentially the power was about the same. The lesson was this: with tuning he could build either the single- or twin-plug engine and tune for power with normal cam and valve adjustments.

Another customer called to ask, "Why can't you make an engine bigger than a 2002 cc?" Long story short, he discovered that some hot rodders use a Honda rod-bearing that is considerably smaller than the GM unit he'd adapted. That meant another trip back to Carrillo for another set of slightly shorter rods with a 19mm wrist pin and more testing. That produced a 2132 cc engine with even more torque, more top end power and even better drivability. Though he's made huge gains in displacement, the exterior is dimensionally the same as a stock motor. The only limitation is on cam size, though Willhoit's not worried about that because he's not building race engines. His is the performance street market. He's up to about 160 hp and 150 ft/lbs of torque with the 2.1 liter motor, which is on par with the early 911s. So now he offers both the 1.9 and the 2.1 liter Willhoit's engines to his customers. Due to some further advances in metallurgy, he can offer either of them with the coated aluminum cylinder or a more economical Dura-bar cast iron cylinder set. Both are proprietary Willhoit products. There are also options for cam sizes and, of course the single or twin plug configuration.

Although he's played around with some 4-cam engines, he recognizes it's an entire world unto itself and isn't prepared to go in that direction. There are already people with considerably more knowledge and experience. For his Carrera customers, he works with established 4-cam experts.

### Keeping a stiff lower lip

Adding as much as 100 horsepower to a car originally developed for 40 to 50 led Willhoit to do some rethinking on chassis preparation as well. Back in the '90s they were block sanding a cabriolet on a chassis jig they use to push the cars around. His chassis jigs are designed to stress the unibody to recreate the loads of the missing engine, transmission and suspension parts during body and paint work. Still, they noticed the door gaps would change slightly as they moved cars around the shop.

Willhoit had owned a Speedster that had been raced earlier in its life. Its owner had welded angle iron all the way around the perimeter of the interior. Most Speedsters and cabriolets will flex from two to four millimeters on a lift. His Speedster didn't budge. Drawing from that lesson, Willhoit had some 12-gauge plates made with holes in them for plug welding. Now, any time they do the longitudinals on a car, they weld these plates in. The process requires some modifications to the heater tubes, but it stiffens the car considerably for a more solid ride, better power delivery and better handling, all while enhancing the durability and preserving the original look of the car. He reckons the increased time, energy, design – and of course money – is worth it in the long run.

### Colors: chasing a moving target

Willhoit is also well known for original color paint sampling. In past decades it may not have been such an issue, but today's market is driven by increasingly stringent demands for detail and perfection. There were several issues – some chemical and some regulatory – that led Willhoit to delve deep into the mad science of color in a quest for original colors and consistent, repeatable paint formulae. Maybe the largest one has been the switch from oil-based to water-based paints to satisfy environmental concerns in the last several years. Above all, it's meant that the original German Glasurit 21 line has been phased out, necessitating a scramble to match those colors with the modern paints and methods. Willhoit had dozens of paint samples from formulas created for the Glasurit 21 line. Even then, Willhoit found over the years that some of those weren't accurate either. So they researched and experimented to reformulate those colors for originality and consistency. Before Glasurit 21 was phased out, Willhoit and his crew mixed up quarts of the original formulas so they had samples of nearly everything to begin matching colors with the newer, regulation-compliant paints.

That worked well for his own shop, but then a friend suggested that he offer color sampling as a service to the 356 community as a whole. While it's not a money-maker, as a service it's helped to bring about consistency in color sampling and has also been a good promotional tool for Willhoit.

They're all done in Glasurit 21. So he tells people, "if you want authentic Ruby Red, then pay the \$35 and get our sample. Maybe your guy can match it." Though there are still a couple of colors Willhoit doesn't have a good sample for, he prides his shop on getting it right. When somebody wants some obscure color, his guys can say "here it is..." He's confident their samples are always correct.

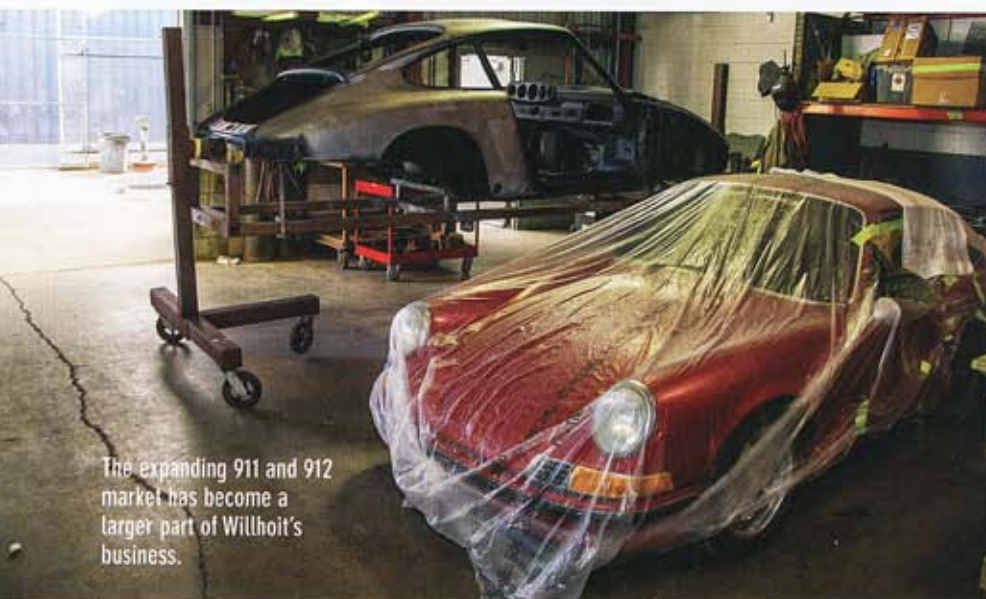
Still, he warns, painting is a dark art and its science is a moving target. The changes in technology and environmental concerns have brought difficulties for keeping everything current and consistent. Willhoit notes that "if a car was painted with single-stage and I had to match the door with a base coat/clear coat, I could match it in the sunlight, but it might not look the same in the shade...There's no perfection in painting." The best results will always come from repainting the entire car. Further, even with cars wearing their original paint, it's impossible to know if the paint matched from batch to batch. There was no digital matching; they used a scale to measure formulas. Willhoit says Ruby Red is one of the colors with which the formula seems to vary. He's been at concours where several cars were parked together, all claiming to be original Ruby Red and there were considerable differences from car to car.

As we finish our discussion before heading off to lunch, we talk about our community of 356 enthusiasts and their legendary appetite for originality. Willhoit says he doesn't worry so much about the smaller stuff like correct headlamp lenses or knobs. He'll spend the time if that's what the customer wants...at a price. He's more worried about the fundamental fitness and stability of the cars. Instead, he looks at the details as perfect opportunities for owner involvement. Foraging through the forums and digging through the swap meets not only gives owners opportunity to become more intimate with their cars, it keeps the social aspect of ownership alive too. It's not just showing up at a concours to stand next to your "perfect" car, but instead about getting to know more about the cars and interacting with more of the great people involved.



In the spray booth, even the undercoating and interior finish - much of which will never be seen - is given careful prep and application.

In the end, as in the beginning of Willhoit's career, the most important part of his life's work in the world of 356s is that it's fun. A self-described workaholic with no claims to other hobbies, he does it because it's what he's loved most since that first ride at the golf course as a teenager. Come to think of it, when you restore and drive some of the finest examples of 356s and early 911s in the world, why would you need a distraction?



The expanding 911 and 912 market has become a larger part of Willhoit's business.



Not all projects are ground-up. A previously restored 1958 Speedster gets a refresh, including detailing its engine and an upgraded modern oil cooler (unseen but an important upgrade).