

### Lightweight 911 Model Comparisons – R, ST, RS & more

Model	911 R prototype (production)	Larousse Tour d'France	S-T (911S Sport)	Carrera RS Lightwt. - M471	Carrera RS Touring – M472	SC
Year	1967	1970 modified ST	1969-71	1973	1973	19
No. Manufactured	22 <sup>9</sup>	1	35	200 <sup>4</sup>	1,308 <sup>5</sup>	
Weight (kg.)	800 kg	789 kg	840	960	1075 <sup>5</sup>	
Weight (lbs.)	1,760 <sup>9</sup>	1,735	1,848	2,112	2,365	2,1
Windshield	thin, 4 mm glass		thin glass option	Glaverbel <sup>13</sup> glass		thin
Side Windows	Plexiglas, louvered for rear ¼		Plexiglas	Glaverbel glass		
F Quarter Windows	fixed, ventilator discs		Plexiglas	Glaverbel glass		
Rear Windows	2 mm Plexidur		Plexiglas	Glaverbel glass; 3.1 mm thick	rear ¼ windows open	
Seat Pan, Back and Sides	stock		thin steel	0.7 mm steel in seat recess <sup>3</sup>		
Main body skin panels	normal		normal	thin steel (0.7 mm, not stock 1 to 1.25 mm) <sup>3</sup>		
Roof panel	stock		thin steel	0.7 mm steel		
R Side panels	stock		thin steel			
F Fenders	fiberglass	fiberglass		0.7 mm steel		A
Engine Lid	fiberglass					A
F Hood	fiberglass	Al	fiberglass option	0.7 mm steel		A
F & R Bumpers	fiberglass	Al or fiberglass	fiberglass option	polyester, no trim	R = steel	GL fiber
R Taillight Housings	fiberglass					
F turn signals	small button type					
Doors	Al <sup>1</sup> w/plastic handles <sup>11</sup>	fiberglass	Al skin, steel frames	0.7 mm steel		A
Window winders	deleted			manual	electric	

Floorboards	drilled			0.7 mm steel		
Shift lever platform				0.7 mm steel		
Hinges	all were Al					
Door Stop Arms	leather strap					
Hood & Engine Lid Locks	rubber	rubber	rubber <sup>12</sup>	rubber		
Engine Lid Grill	stock	wire mesh	stock	stock	stock	sto
Undercoating	?		none	none	varies	
Soundproofing	none		none	minimal	stock	
Paint	stock		minimized, thin			
<b>Interior:</b>						strip
Dashboard	no fuel gauge or clock					
Rear Seats	no	no		no		
Heaters	no		no			
Heater Ducts	stock		no			
Seat slide supports	stock		no			
Seat belt anchorage points	stock		no			
Int. Door Panels		plain w/strap		plain w/strap		
Carpet	lightweight	none	none	black needle felt, 300 g/m2; rubber mats <sup>8</sup>	carpet	
Ashtray	no		no			
Clock	no			no		
Passenger Sun Visor	no		no	no		
Glove Box	no lid	no lid	no lid	no lid		
Horn Button	no					
Driver's Seat	Scheel bucket	rally	Recaro sport	lightweight bucket	Recaro reclining	
Passenger Seat	plastic, from 906	rally	Recaro sport	lightweight bucket	Recaro reclining	
Wiring						
Dashboard						
Ventilation Blower						
Wipers						
Oil tank	Al, ahead of rear axle					
Fuel Tank	22 gal.,			plastic for		

	plastic (steel)			Euro-spec cars		
<b>Suspension:</b>						
Front A-arms	steel			steel		
F. Crossbar						
F. Suspension				Torsion Bars; Bilstein shocks <sup>2</sup>		
R. Trailing Arms				steel		
R. Suspension				Torsion Bars; Bilstein shocks <sup>2</sup>		
<b>Brakes:</b>						
F. Rotors						
F. Calipers				Al "S" type		951
R. Rotors						
R. Calipers						951
F. Wheels	Fuchs 15x6	Minilite		Fuchs		
R. Wheels	Fuchs 15x7	Minilite		Fuchs		
<b>Engine:</b>	<b>2.0 L</b>	<b>2.4 L</b>	<b>2.3L to 2.5L</b>	<b>2.7</b>	<b>2.7</b>	
hp @ rpm	210 @ 8,000	245 @ 8,000		210 @ 6,300		
torque - mkg	21 @ 6,000 157 ft-lb			188 ft-lb @ 5,100		
Conn. Rods	Ti					
Oil Tank	Al					
Transmission	901/902		915 w/pump	915 Mg case	915 Mg case	

## Notes:

If a source does not mention modification or deletion of a feature, the table assumes it is stock. If a feature is deleted, the table cell reads "no." If a lightweight feature is present, the table cell reads "Y" or gives the type (i.e. lightweight fenders are represented by fiberglass or Al, for aluminum).

I've tried to cite to known and reliable sources for the information compiled here, rather than relying on rumors or oral history (although written sources are not always accurate either). I tried to indicate items that are uncertain with a question mark, while still giving the best available information on the item. Some comparisons are perhaps flawed because the specifications for the measurement are not given or have changed over the years. For example, the car's weight could be given by a source as dry, or wet. Moreover, wet could mean with oil, gear lube and ½ tank of gas, or with a full tank, and the amount of gas the tank holds can vary among models and years. There is or was a DIN spec. for car weights, but I have not been able

to find out what it is, or if it has changed over the years. Some information below (but not in the table above) is based on Email between me and Jim Calzia, Tyson Schmidt (TRE), Jack Olsen and others, or on posts from various Internet BBS's, usually the Pelican Parts one. I originally began this as a way to think about lightening my own car and it has attracted some interest, so I've buttressed it since then. Please report any errors or additions with a citation. And definitely report any exciting light weight 911 that you build. This version is dated May 21, 2006. (c) Randy Webb, Editor.

Abbreviations: Al – aluminum; Mg – Magnesium; Be – Beryllium; FG – fiberglass; CF – carbon fiber; < less than; > greater than

<sup>1</sup> Adler (1998, p. 39) states the 911R had fiberglass doors (p. 39); Colman states they were Al (*Excellence* # 31: 89).

<sup>2</sup> The gas –pressurized Bilsteins were used for the first time as std. equipment and saved 7.7 lbs. Adler 1998, p. 39.

<sup>3</sup> The thinner sheet steel (0.7 mm) was used in the luggage compartment floor, floor pan, doors, roof, hood, front fenders, rear seat recess in the floor pan and shift lever platform according to Adler (1998, p. 39). After the first 1,000 light weights were built with the 0.7 mm sheet metal, the factory began using the normal sheet metal with undercoating applied, as in the normal S models (?? p. 64). Stout (2002, p. 58) claims the sheet metal was 0.8 mm thick.

<sup>4</sup> Porsche built a total of 1,583 including the homologation specials. 49 were rebuilt as race cars (2.8L RSR). Boschen and Barth 1978, p. 327.

<sup>5</sup> The 1,075 kg. Touring RS models often had electric windows and sunroof.

<sup>6</sup> Jim Calzia's car – article in *Excellence*, May 2001

<sup>7</sup> GrantG's car – Carbon Copy article in *Excellence* 123: 94. Created by Pierre Bilodeau and Serge LaBelle. About 300 lbs was saved from the change from steel to M A Shaw CF body panels. The dash is only a thin shell (feels like plastic, but maybe it is CF (can't see the underside without removing it). 87 lbs. of paint, undercoating and sound deadener removed from inside and outside of the floor pan. Deck lid hinges, deck lid cable brackets, Al hubs in the lug nut webs and many other pieces were drilled. Coil-overs replace the "heavy stock torsion bars." – p. 98.

<sup>8</sup> Reisser, Sylvain. PORSCHE. page 101.

<sup>9</sup> Morse states that 24 911 R's, including 4 prototypes, were built. *Excellence* 33: 50. The prototypes weighed 1,760 lbs., with the 20 production cars weighing 1,810 for circuit racers, and 1,800 for rally cars. *Excellence* 33: 52. Colman also states there were 4 prototypes and 20 production cars. *Excellence* # 34: 91.

<sup>10</sup> Stout states that the Glaverbel glass was 3.1 mm thick while the stock glass was 3.5 mm thick. *Excellence* 110: 58. This is a reduction of only 11.4%; assuming equal densities, this meant little weight savings.

<sup>11</sup> The exterior door handles were changed from metal to plastic. Colman, *Excellence* # 34: 90.

<sup>12</sup> The front and rear lid latches and the tubes for the latch cables were deleted. Anderson, *Excellence* # 80: 125.

<sup>13</sup> Glaverbel glass was a Belgian made safety glass (Adler 2003, p. 158). Stout states that the Glaverbel glass was 3.1 mm thick while the stock glass was 3.5 mm thick. Excellence 110: 58. This is a reduction of only 11.4%; assuming equal densities, this means little weight savings. e.g. The stock rear glass weighs 16 lbs., so only 1.8 lbs. would be saved – unless the glass had a lower density.

1968 T/R – Lightweight versions of the 911T using the 911S engine were used for competition. Paternie, Red Book, p. 14.

The rally version of the 1971 S-T weighed 960 kg with 180 hp 2.2L engine instead of the 840 kg of the racing version which had a bored out 2.247L, 240 hp engine (M. Cotton, p. 83). Customers ordered a 911S with option code M490, which deleted bumper guards, internal sound deadening, carpets, headliner and the glove box door. M490 also fitted lighter weight corduroy covered sport seats, simple cardboard door panels, and Al bumpers. The Racing Dept. also produced 100 sets of special light weight components for the ST [fiberglass options?]. Leffingwell, p. 60. Sheet metal joints were not filled, and the bumper moldings, fog light covers, rear torsion bar covers and front torsion bar protectors were deleted. Anderson, *Excellence* # 80: 126.

Some models deleted the front crest on the hood, which only weighs 0.09 lbs.

The light weight cars of any era were based on the standard 911 of that era, which changed periodically. For example, lighter rear banana arms (which were also stronger and cheaper to make) were introduced in the mid-1970s. Thus, the early lightweights did not have these, nor did they have the Al front suspension crosspiece. As engine power and size increased, the transmission changed from the lighter weight 901 to the heavier 911 type (often called a '901'), to various version of the 915, which was heavier to begin with and grew heavier over time. Increases in engine size and power also required a stronger crankcase made of Al rather than Mg. This change, made in 1969, added 22 lbs. to the crankcase. Leffingwell, p. 48. And, of course, today's ceramic technology and carbon fiber was not available when the factory light weights were made. It should be possible to produce a very light clone car today, especially one ceramic technology for brake rotors and clutch plates percolates down to the aftermarket. If someone were to combine that with the techniques used in Jim Calzia's and GrantG's cars (above table) significant lightening could be achieved in a clone. At a rough guess, one could produce an RS clone weighing about 1,500 lbs.

Another evolution was the increased use of technical engineering tools. One important advance in virtually all manufacturing industries was the rise of modern numerical methods and the computer power to run such mathematical models. Numerical methods like distributed parameter modeling (finite element analysis) allow the calculation of stress, heat transfer and other factors of interest throughout the volume of an object. For example, one can place hundreds of nodes all over the unit body of a design and write equations for the stress and strain at each such node, then run the model on a fast computer to test the chassis layout without having to build a series of test mules. Numerical methods are critically important in areas where analytical equations for the process have never been solved, such as aerodynamics. Porsche used such methods to redesign the crankshaft for the 993 in the mid-1990s (Tobias engine book) and these 3.6L engines weigh less than one would imagine given their power or displacement. It

might be possible to design a much lighter and stronger crankshaft for the earlier engines using a modern CAE/CAD package.

As technology advances, it should be possible to take an early 911, and continually lighten it over the years. The car you own today could be passed on to your offspring who lighten it and repeat the process. Thus, the car – and its light weight concept – can outlive its times, and its owner.

1967 - < 25 911 R's produced; Piech decided on FG body panels as Al were too expensive but both materials were tested on the four prototypes (*Excellence* # 33: 51)

1969 - ~35 911 Set's produced; lightweight body shells produced for rally cars and pavement racers; based on the lighter T models with S engines; termed 911S models

1973 - Carrera RS's produced for Group 3 and street

1973-74 - RSR's produced for Group 4; 2.8L engine

1974 - 3L engines used

911R weighed 1810 lbs. w/o fuel; 1900 lbs. in rally trim – Ludvigsen, p. 456

Larousse's Tour de France car weighed 1715 lbs. (778 kg); used Mg crankcase from the 906 – Ludvigsen, p. 458. Many parts of the Tour d'France car were drilled for lighter weight, and "extensive use was made of titanium." Cotton, p. 88. Cotton also states that it had fiberglass bumpers.

SC/RS weighed 500 lbs. less than SC; thin glass; no heat exchangers (gas heater in front) - *Panorama* Aug. 1985, p. 9

## Other Notable Cars

Black Beauty II Jack Olson car – modified 1972 911 with 3.6L 964 engine (only mods are the B&B exhaust and the NBD chip); 2,389 lbs. with 243 hp at rear wheels; wt. distribution, F/R 39/61; torque tube cut and engine shifted forward 1.25" for wt. balance; very wide flares, has A/C, carpet, and some ext. trim; prepared by Tyson Schmidt (TRE Motorsports); Goal was to combine high grip of wide tired RSR type cars with nimble handling of narrower RS cars; LRX custom F. spindles, front A-arms have been lengthened by about 1 1/3 inches and mounting points have also been changed; Hamlin Fabrication R. camber boxes that modify the mounting points for non-turbo 911 pivot boxes to allow easy at-track camber and roll center adjustment (cheaper than 930 trailing arms). Also claimed to dramatically improve rear suspension geometry to decrease squat tendencies, accommodate very low ride heights but no change to toe settings. R. Bilstein coil-overs and 935 type spring plates. Tyson tied the center tunnel in with the torque tube, and added diagonal braces between the inner rockers and the center tunnel, which no doubt help as well. *Excellence* # 125, December 2003; and Pelican Forum threads: <http://forums.pelicanparts.com/showthread.php?s=&threadid=133828&perpage=20&highlight=tyson%20black%20beauty&pagenumber=3>  
<http://forums.pelicanparts.com/showthread.php?s=&threadid=134544&highlight=webb+tyson>

Tangerine Freeman Thomas 1969 911 R type clone; *Excellence* #132, October 2004, p. 129; 2,200 lbs., 280 hp 2.8L, many interesting details but little wt. information on this sports purpose '69 car

Yellow car prepared by Jeff Gamroth (RothSport); article in *Excellence* #120, June 2003; 3.7L with variocam, 2,250 lb.

Retro Rocket red RSR Clone – 1,750 lbs (794 kg) with 962 engine and “upside down” 935 turbo trans., making it the lightest known clone – even lighter than a 911 R – even though it has larger fenders and a roll cage; article in *Panorama*, Dec. 2004, but few details

## Sources and Additional Reading

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Adler, Dennis. 1998. *PORSCHE 911 ROAD CARS*. MBI Publishers.

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Leffingwell, Randy. 1997. *ILLUSTRATED PORSCHE 911 BUYER'S GUIDE*. MBI Publishers. 4th ed. revised and updated version of Dean Batchelor's book.

Ludvigsen, Karl E. 1977. *PORSCHE: EXCELLENCE WAS EXPECTED: THE COMPLETE HISTORY OF THE SPORTS AND RACING CARS*. Princeton Publ.; New York, NY; distributed by Dutton, 851 pages, 1st ed. {citations above are to this 1st ed. as I haven't read the 2nd ed. yet}.

Reisser, Sylvain. *PORSCHE*. page 101 – tidbits on the RS.

Starkey, John. *PORSCHE 911 R-RS-RSR*. – comprehensive source (Larousse Tour d'France car was a further modified version of a Steinemann 1970 Group 4 car, p. 14-16) – same book as below??:

Starkey, John. 1987. *THE RACING PORSCHEs, R TO RSR*. Sparkford, Somerset; Newbury Park, Calif.; Haynes Publ. Group.

*Excellence* # 22 - articles covering the R, RS, RSR and ST

*Excellence* # 31: 88-90, February 1992. 911's "R" Us, David Colman.

*Excellence* # 33: 50-53, June 1992 – The Porsche 911 R , Kerry Morse

*Excellence* # 34: 88- 91, August 1992 – “R” Stands for Rare, David Colman

*Excellence* # 47: 96-101, August 1994 – restoring an RS for Manhattan Concours Award, David Colman

*Excellence* # 68: 69-74, April 1997 – Carrera RS & RSR, Part 1 of 2 – John Starkey on the RS and 2.8L RSR

*Excellence* # 69: 97-104, May 1997 – Carrera RS & RSR, Part 2 of 2 – John Starkey on the IROC and 3.0L RSRs

*Excellence* # 69: 86-90, May 1997 – Carrera RS Replica – standard changes

*Excellence* # 80: 124-28, October 1998 – French Connection – Dave Morse's 911 S-T by Bruce Anderson

*Excellence* # 101, May 2001 – Jim Calzia's lightweight race car with weights of various components and modifications – more detailed data on the Early 911s web site at <http://www.early911sregistry.org/jCalzia.html>

*Excellence* # 110: 56-65, May 2000?? – Pete Stout compares the 2002?? GT2 with the 1973 Carrera RS.

*Excellence* # 125: 108-114, December 2003 – Jack Olsen's Black Beauty II  
*Excellence* # 123: 94-98, October 2003 – GrantG's Carbon Copy car; see also various posts and photos on the Early 911 web site  
*Excellence* #132: 129-134, October 2004 – Tangerine Freeman Thomas 1969 911 R type clone  
UpFixin' VII, p. 356 - SC/RS and some history of the "R" cars  
*Motor Sport*, Feb. 1973 – Denis Jenkinson tests an RS  
*Panorama*, June 2001, p. 2 - pristine 911 RSR  
*Panorama*, ?? August 1985, p. 9. P. Kelly – article on SC/RS  
*Panorama* 49(12): 2-10, December 2004 – Retro Rocket - 911 RSR  
*Road Test*, April 1973 – Jerry Sloninger tests a RS light weight  
*911 & Porsche World*, April 2003, No. 109 – several articles on lightweight 911s