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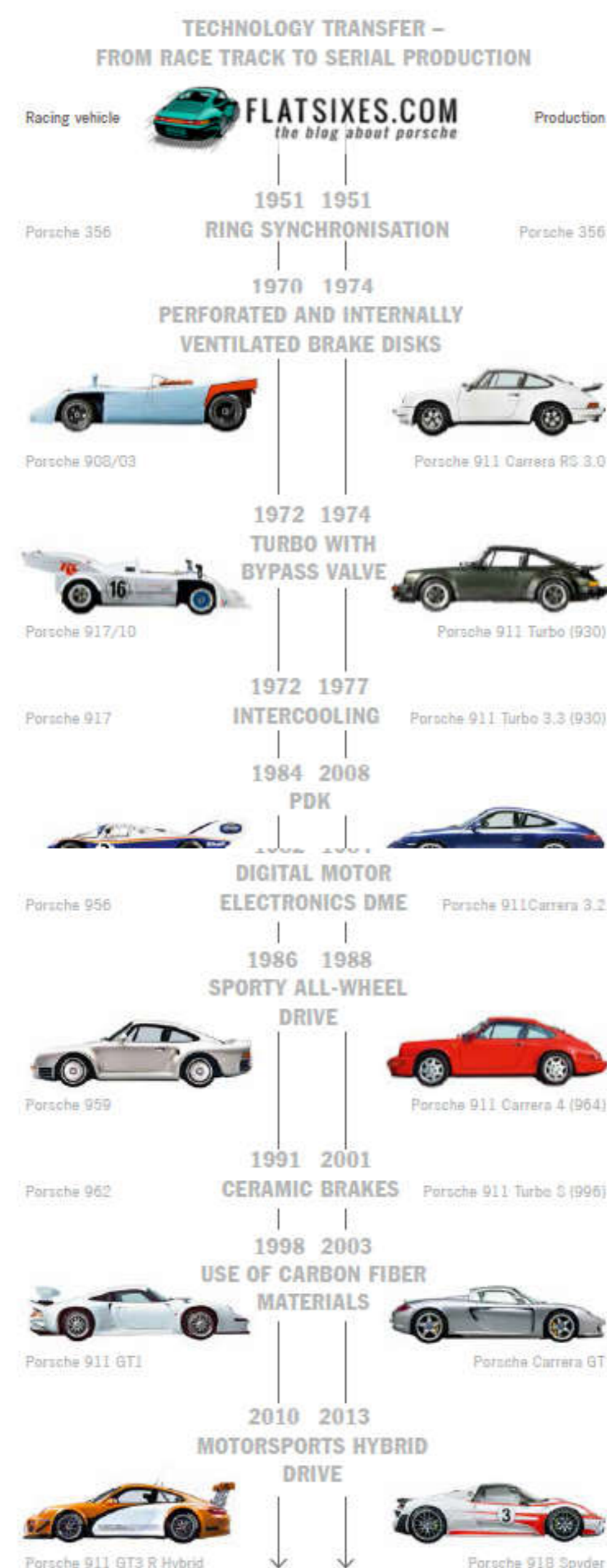
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# 10 PIECES OF PORSCHE TECHNOLOGY THAT TRANSFERRED FROM THE RACE TRACK TO THE ROAD

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## 1. RING SYNCHRONIZATION:

Before there was PDK...Before there was Tiptronic...Before there was Synchronization, there was the legendary "crash-box" transmission. Drivers were expected to have the skills to match engine RPMs with transmission RPMs for each gear. That meant listening and feeling what the car was doing for ever gearshift made, especially downshift. The development of "ring synchronization" meant that drivers could more easily shift through the gears both up and down without fear of grinding gears, or in a Porsche 356 and in production the same year.

## 2. PERFORATED AND INTERNALLY VENTILATED BRAKE DISCS:

Heat is the enemy of all braking systems. Drum brakes eventually developed fins for extra cooling. Even solid disc-brakes cooled dramatically faster than drums. Eventually racers figured that a wider disc with internal channels for air meant a greater cooling surface. Drilling holes or slots for a better flow of air through the disc for even faster

cooling. Better braking can mean seconds or even minutes on a race-course. On the street it means increased safety. First seen on the track in a Porsche 908 in 1970 and in production in a 1974 Carrera RS 3.0.

## 3. TURBO WITH BYPASS VALVE:

Turbocharging had been used for years on Indy cars and airplanes, but the circumstances were entirely different for road-racing and regular street cars. Airplanes and oval-racers run at constant and regular RPMs, where as road-racing cars are constantly accelerating and decelerating, placing different kinds of loads on engines and turbo-systems. The by-pass valve allowed the extra pressure built during a spool-up of the turbo to be released. For racing applications, this meant giant bursts of flames. For road-cars, this meant a more even and controllable surge of power. First seen on the track in a Porsche 917 in 1972 and in a production vehicle in 1974 in the Porsche 911 Turbo.

## 4. INTERCOOLING:

A turbo is just a rotary compressor, pushing air into the combustion chamber at increased pressure, providing more air-fuel mixture to fire and power the engine. Want, more fuel/air? Get a bigger turbo...OR...cool the air, making it denser. The bigger the intercooler, the denser concentration of combustible fuel, making more power. First developed on Porsche's race cars, later used on their street cars. First seen on the track in a Porsche 917 in 1972 and again in 1977 in production on a Porsche 911 Turbo 3.3 liter.

## 5. PDK:

Automatic transmissions have been around for decades, either in form of the hydraulic units used on the family station wagon (remember those?) or the torque converter units developed for the Chaparrals of the 1960s. Neither seemed entirely effective for racing purposes: not quick or reliable enough. But with the engines of Group C (956) and GTP (962) closely regulated, other avenues of development opened for making cars faster. Quicker, surer shifting was one of those. The development of Porsche's PDK (or double-clutch system) meant that one gear could effectively be chosen before releasing the previous one. It meant making each shift almost instantaneous, saving seconds per lap. Originally developed in the 1980s, it has PDK has become standard equipment on nearly all of Porsche's road-going cars. First seen on the track in 1984 on a Porsche 956 and on the road in 2008 in a Porsche 911 Carrera

## 6. DIGITAL MOTOR ELECTRONICS:

Another instance where modern technology combined with tight regulations for engine size and turbo pressure combined to create increased power, response, and fuel efficiency. Using digital sensors to monitor an engine's temperatures, firing efficiency, fuel and air flow, Porsche engineers were able to control all functions of a racing

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engine to provide dramatically performance. As environmental and fuel-efficiency regulations forced changes to production vehicles, that same technology combined to meet greater standards for running cleaner while at the same time generating greater power from the same relatively-small displacement Porsche engines. On track for the first time in 1982 in a Porsche 956 and then on the road in 1984 in a Porsche 911 Carrera 3.2.

## 7. SPORTY ALL WHEEL DRIVE:

Previous to the 1980s, all wheel drive was for clunky Jeeps and SUVs, vehicles used primarily for off-road or bad weather. Commencing with its 959 super-car (and its racing cousin the 961), Porsche was able to develop an all wheel drive system that enhanced both handling and safety for smooth road driving. Using a system that electronically and hydraulically monitored and controlled the amount of drive to each wheel independently, modern AWD systems contribute to a much superior dynamic car balance during driving. First seen on the track (it's a bit of a cheat) in 1986 in the Porsche 959 and in production in 1988 in the Porsche 911 Carrera 4 (964)

## 8. CERAMIC BRAKES:

Once again, management of brake heat contributed to a dramatic increase in braking power. Composite ceramic discs function with much more efficiency over their steel counterparts. Though racing carbon-fiber brakes wear too rapidly for regular street use, modern composite ceramic brakes provide much improved brake wear for the average user. First seen on the track in 1991 in a Porsche 962 and then on a road going Porsche in 2001 in a 911 Turbo S.

## 9. USE OF CARBON FIBER MATERIALS:

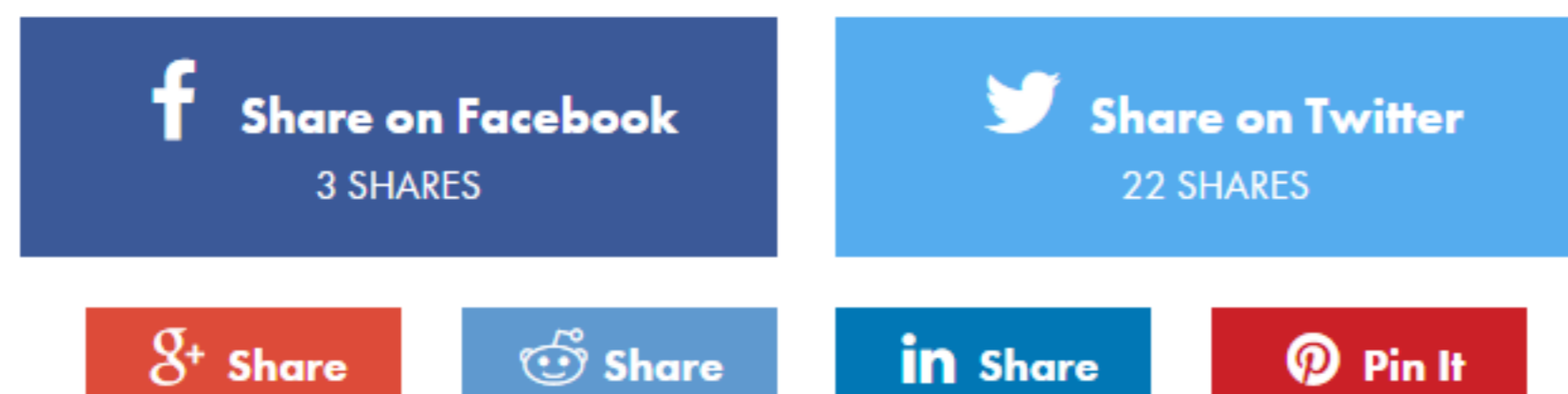
The bugaboo of all modern, technologically enhanced cars is increased weight. Extra computers, more hydraulic lines and pumps, creature comforts such as sound-deadening, seat heaters, stereos and more means that Porsches are much heavier than the 356 or early 911 of yester-year. Though carbon-fiber was thought exotic in the 1980s, contemporary cars see its use for both structural and decorative purposes. The 911 GT1 was the first Porsche to make extensive use of Carbon Fiber in 1998 and we didn't see it again until the Porsche Carrera GT in 2003.

## 10. MOTORSPORTS HYBRID DRIVE:

We saw KERS (Kenetic Energy Recovery Systems) on Formula 1 starting in 2009. It wasn't long after that Porsche began testing KERS on its GT race-cars. Then Le Mans adopted hybrid technology for its top prototype classes and we watch the e-Hybrid Porsche 919 as it makes its bid toward reestablishing our favorite marque at the famous French classic. Et voila! Porsche's flag-ship supercar is the 918, a car which can run in modes from full electric to full hybrid generating close to 900hp. Much of its power and torque is regeneratively collected while braking, just waiting to be used on demand. The revolutionary 2010 Porsche 911 GT3 R Hybrid led the way for today's ultimate road going Porsche, the 918 Spyder.

With technological advances such as these in the last 50 years, we can only imagine what Porsche might develop in the next 50.

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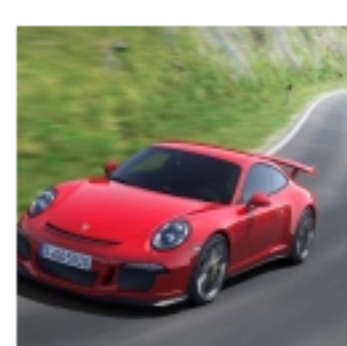
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