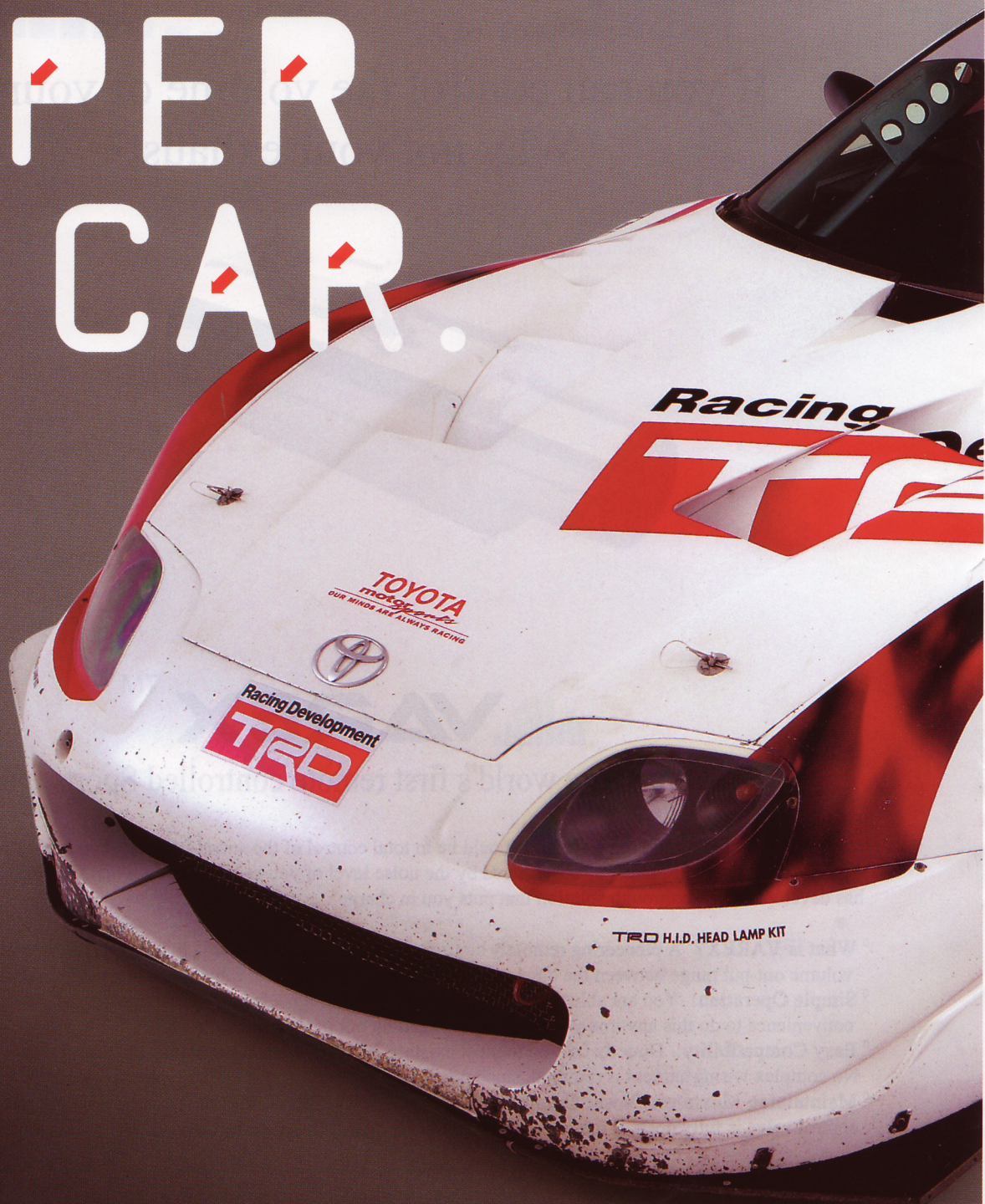
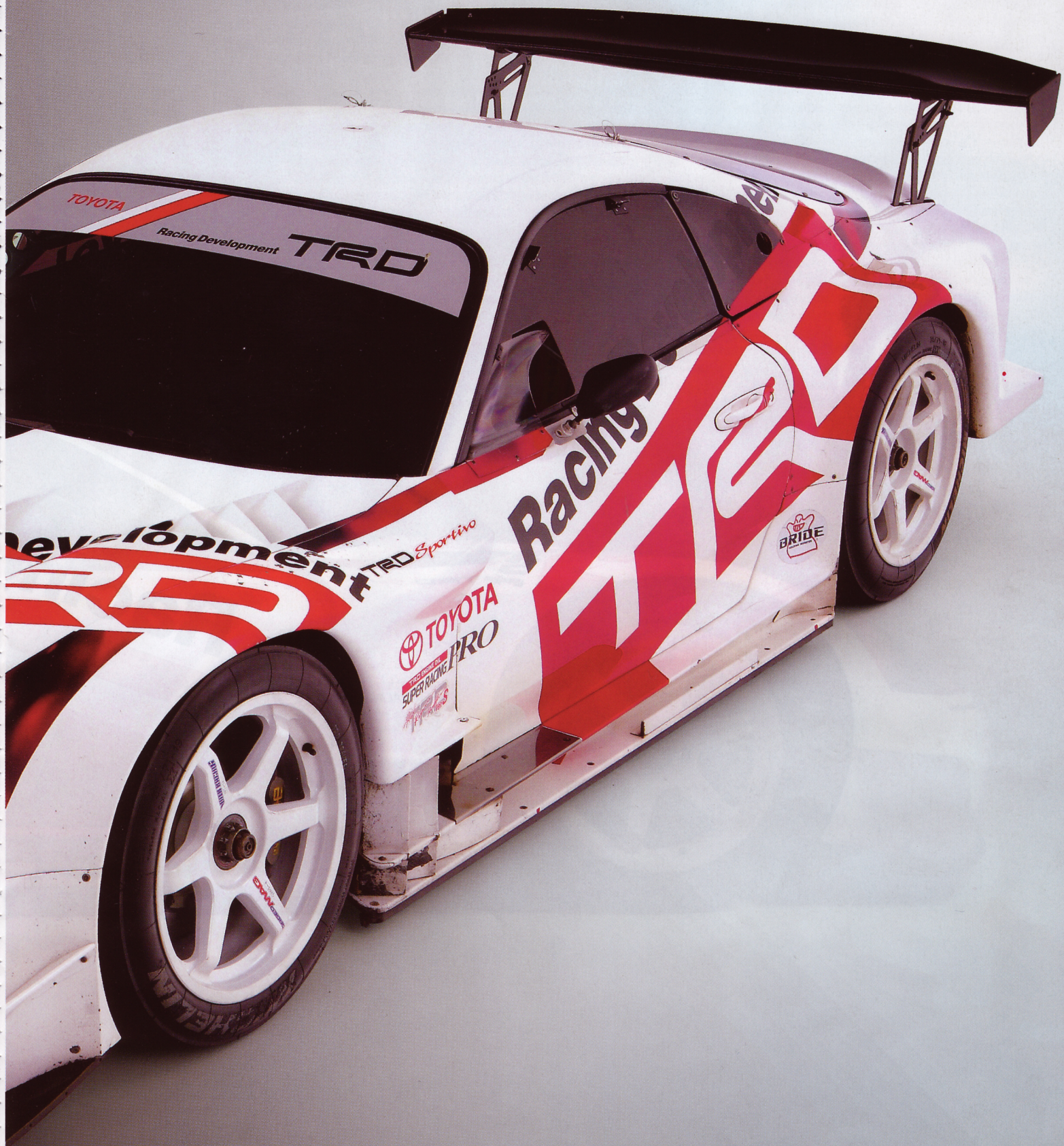


# ANATOMY OF A SUPER GT CAR.

AUTO SALON MAGAZINE IS PROUD TO PRESENT THE FIRST IN-DEPTH PHOTOSHOOT OF A GENUINE GT500 CLASS SUPER GT WARRIOR IN AUSTRALIA THANKS TO TRD AUSTRALIA.



PUT YOUR EYES



## RUB YOUR EYES

in disbelief, but the answer is still the same. Yes, this is a real-deal GT500-spec Supra from Japan, a veteran of Super GT racing (though this chassis dates from the earlier JGTC era), and it is here in Australia.

While it's amazing enough to think that an actual race car from Japan's premier GT racing category has made it all the way Down Under, this car is extra special as it also served as an R&D vehicle for TRD to develop their championship-winning cars.

Toyota Oz brought it over as a way to promote their new local TRD range, using it as an image-building tool to show the thousands of Aussies who never knew about Toyota's rich racing history, or their huge TRD (and TTE) following in Japan and Europe. What was once a GTI-spec car in JGTC is now a GT500 class machine in Super GT, one of up to six vehicles TRD built in that particular year to not only contest the highest of the two international championships, but to push the boundaries of development in a series placed under tight regulations and parity controls. As such, it has extra datalogging ports not seen on race cars.

For those that don't know, Super GT (formerly known as JGTC) started in 1994, growing from the death of the All Japan Sports Prototype Championship (for Le Mans-style Group C prototype racing cars), as well as the switch in regulations in the Japan Touring Car Championship, when they changed from the International Group A formula to "Super Touring" type cars. The championship is split into two classes, GT500 and GT300 and is made up of long distance races, requiring two drivers, while the cars are heavily restricted to power and weight levels.

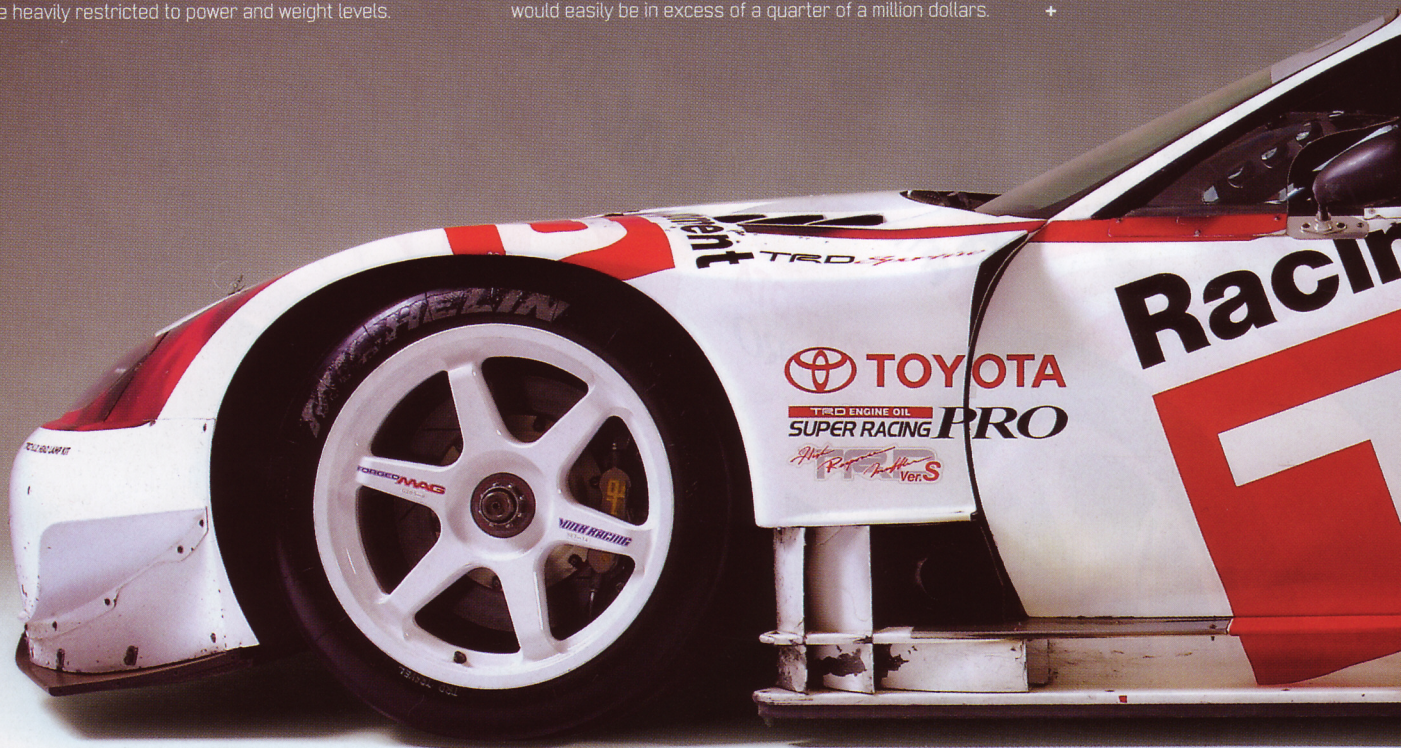
GT500 cars are allowed a maximum of 500 horsepower (375kW), while GT300 are more restricted and put out a maximum of 300hp (225kW). As the organising body want the format to remain a GT class, they must also be two-door body shapes and rear-drive (with an exception granted to the rear-wheel drive converted Cusco Subaru Impreza).

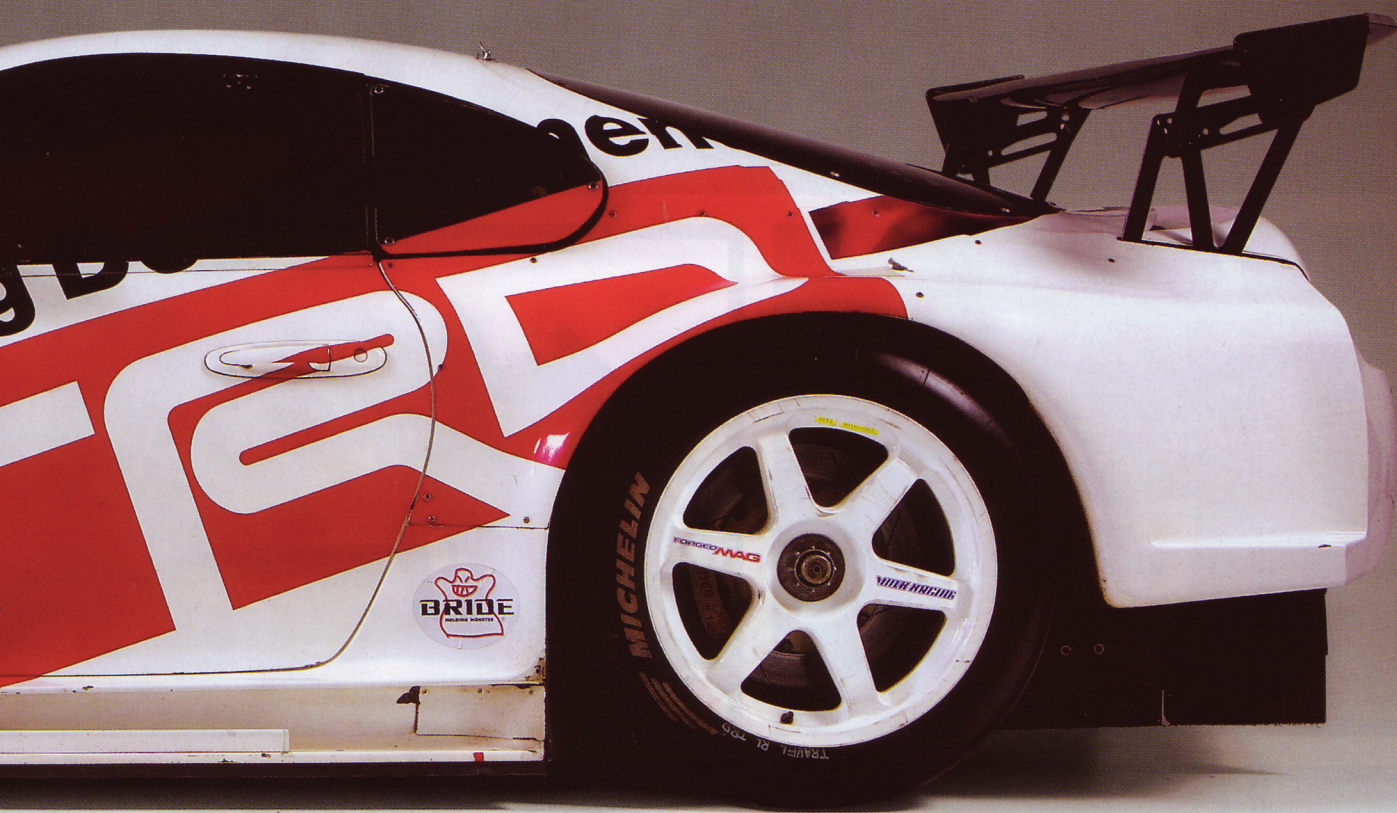
The JZA80 Supra platform had a glittering career in GT500, scoring four outright championship wins between 1994 and 2005. The first came in 1997 with Michael Krumm and Pedro de la Rosa (Toyota Castrol Team Tom's), then in 2001 in the hands of Hironori Takeuchi and Yuji Tachikawa (Racing Team Cerumo) and backing up in 2002 thanks to Juichi Wakisaka and Akira Iida (Esso Le Mans), with the final title win coming in 2005 to the Zent Cerumo Supra, piloted by Yuji Tachikawa and Toranosuke Takagi. For 2006, the Lexus SC430 has taken over the mantle of Toyota's Super GT warrior, and the V8-powered brute even won the 2006 GT500 championship in the hands of Juichi Wakisaka (again) and Andre Lotterer, driving for Open Interface Toyota Team Tom's. In total, there are 26 recorded victories in the Level 1 category, cementing the car as one of the all-star performers.

The build plate for the car credits Toyota Technocraft as the constructor of chassis number "534N #26", with the motor listed as "3S-GT - #107". Due to the expense of building and maintaining these chassis and engine packages, the fact that there were over 100 motors and 26 cars already built by the time this machine came along is staggering, and shows the commitment that Toyota had to the JGTC formula. It's clear to see that with the amount of custom fabrication and the materials used, the build cost per-unit would easily be in excess of a quarter of a million dollars. +

### HOW MANY?

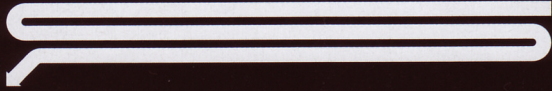
With TRD constructing five or six new chassis each year, the number of TRD GT500 chassis could be as high as 72! However, there have been plenty destroyed by crashes and even a few pulled apart to act as parts donors for newer cars.





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"THE BUILD COST PER-UNIT WOULD EASILY BE IN EXCESS OF A QUARTER OF A MILLION DOLLARS."



## ENGINE

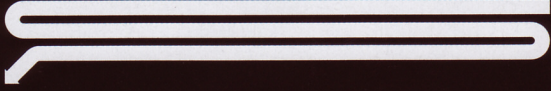
GT500 Supras have used various methods of propulsion over the years, and despite the legendary tuner status of the 2JZ it's been without six-pot power. Why? Easy: weight, fuel efficiency, deck height and positioning in the engine bay are all critical factors that rule out a long, heavy twin-turbo in-line six.

Early cars like this one use a highly evolved version of the two-litre four-cylinder 3S-GTE – a motor that saw extensive use in Toyota Team Europe's Group A Celica GT-Four rally cars. While we'd love to give you guys the skinny on what lies within the low-set block, the actual specs are top secret.

We can tell you that it was built from the ground up, but isn't as extreme as many would think. This is due to the 375kW power limit, enforced by a 43mm intake restrictor, which sees the motor producing peak power at a lazy (for a race car of this stature) 7,200rpm. Torque is monstrous, with over 590Nm at a lowly 5,200rpm, while power delivery can be altered to come in between 6000 and 8500rpm, depending on the track and what ECU is used.

It is unclear whether the motor is still of the original 2.0-litre capacity, or whether it has been stroked and bored to a larger size, but the low RPM ceiling and high torque figures point to a swept volume now larger than 500cc per-cylinder. What is more amazing is how far TRD went to ensure that it now sits below the height of the rims and well behind the front wheels, effectively turning the chassis into a mid-engine/rear-drive machine.

This is beneficial to the handling and braking, ensuring the weight is between the axles and as low as possible. Interestingly, the radiator is V-mounted in the nosecone, while the small front-mount is positioned horizontally.



## AERODYNAMICS

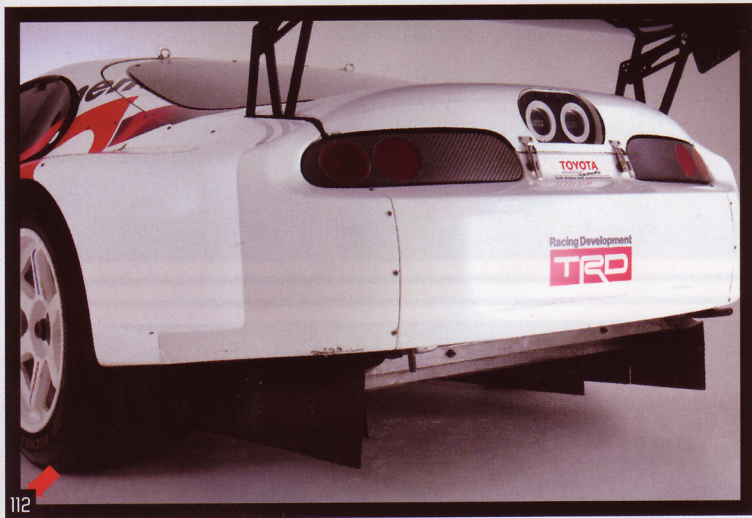
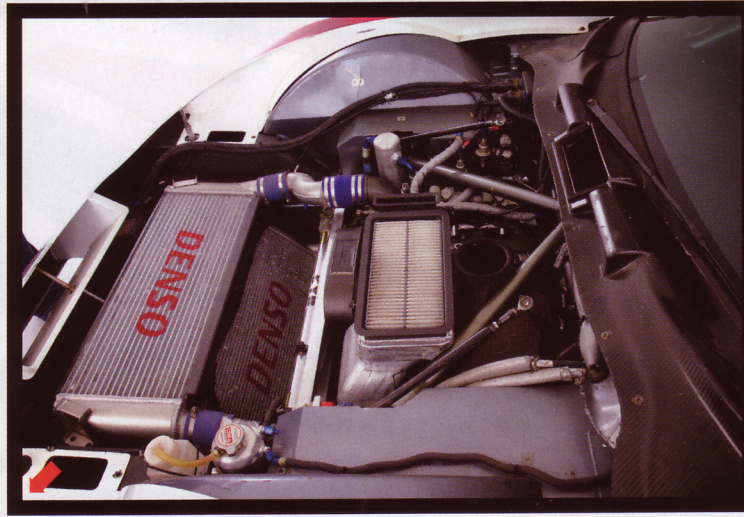
As the power limits are so tightly controlled, aerodynamics are hyper-important in JGTC/Super GT. Though it is constructed from raw carbon fibre, the bonnet easily weighs double what a stock JZA80's does, mostly due to the sheer size of the multiple air channels crafted into it. They flow air from the under-trays, through the radiator and intercooler in the engine bay, and out over the body work of the car.

The major way for the car to get the best downforce possible is by using a flat floor, with the TRD effort being totally crafted out of carbon fibre that is boxed in with incisor-sharp channels under the side skirts to keep the airflow straight. It starts at the upturned front lip and flows all the way under the machine until it exits just after the diff cooler in an unbroken tunnel of suction. This downforce assists braking distances, traction during acceleration and mid-corner speed and helps the cars remain stable at the 300km/h top speed they hit at Fuji Speedway.

Even the headlights (which are actually HID driving lights) are housed within custom carbon fibre buckets, while the front bar, front guards, bonnet, rear hatch, sideskirts, rear guards and rear bar are all made from a mix of carbon fibre and carbon Kevlar to shed massive amounts of weight and make everything stiffer than an iron bar.

On the towering GT-wing, while the top of it is gently curved upwards, there is a flat-faced lip that juts straight upwards to provide another kick of downforce for the rear end; a very important facet when you've got 375kW and 590Nm pushing only 1100kg. The wing itself is utterly massive, spanning the entire width of the broad-shouldered coupe and being deep enough (from front to rear) to host a dinner party on.

**PENALTY PARITY**  
Super GT is one seriously tightly governed racing series, with strict controls over weight, power, fuel capacity and a parity system that uses ballast to penalise leading cars and keep performance gaps under control. Far more extreme than the weight penalties dished out in other racing series, the governing body assigns the ballast depending on each car's performance over the race weekend, and take into account qualifying position and individual lap times.



1. Braided lines and Earl's type aero fittings are used for all hoses as they can handle extreme high pressures

2. Engine is mostly covered by ducting and pipe work for the turbocharger, including the 43mm intake restrictor

3. The rocker cover of the 3S-GT motor sits lower than tops of rims and behind the front wheels

4. The engine makes 590Nm at 5200rpm and makes its capped 375kW at 7200rpm

5. Black rods are adjusting arms for the thick front sway bar and run back into the cabin, where the driver manipulates them

6. Air flow through the engine bay has been optimised by careful use of radiator and intercooler positioning

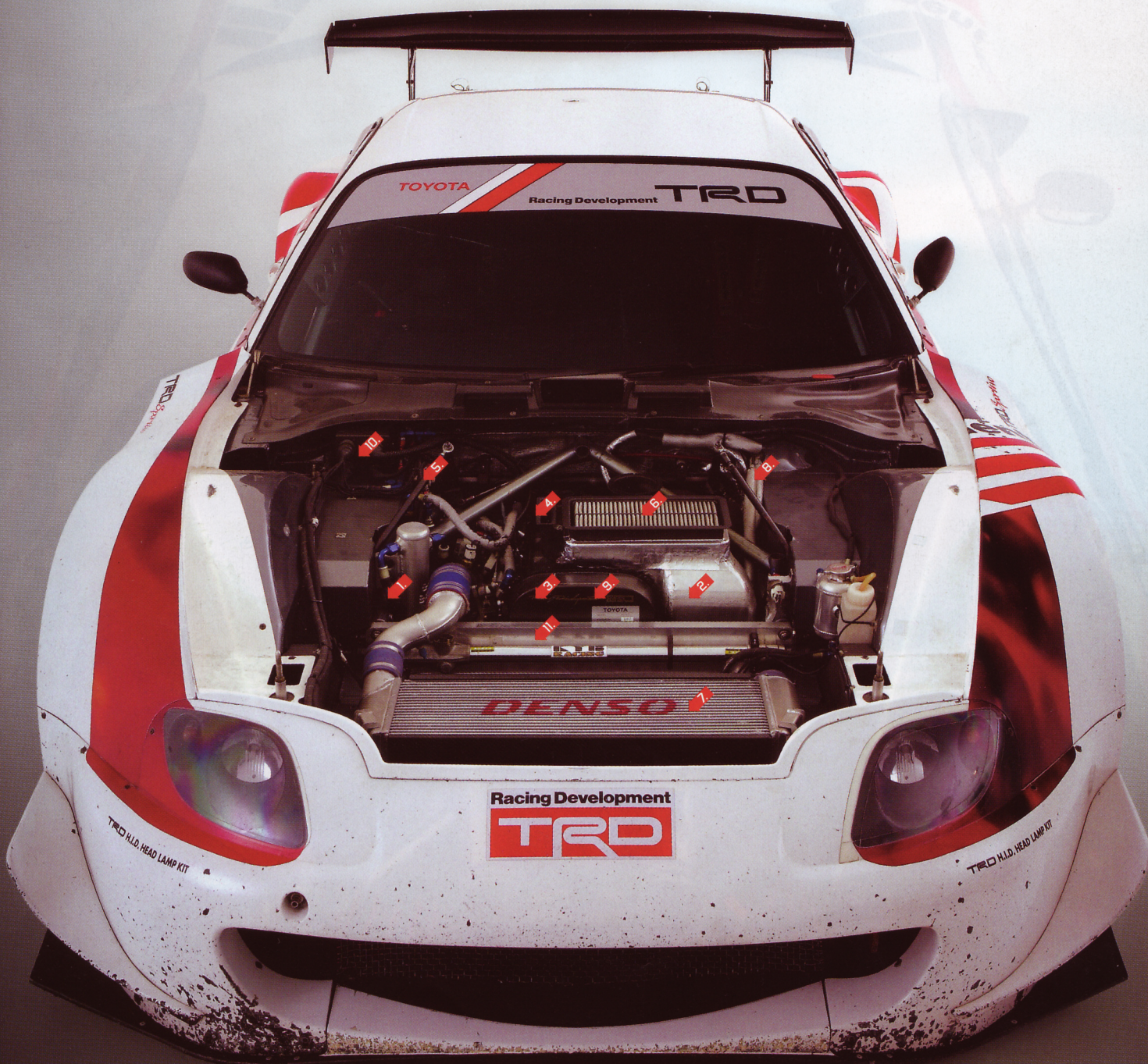
7. Intercooler design places thermal efficiency above pressure drop on order of importance due to all the races being enduros

8. Clear lines carry oil to the rear of the car, where the dry sump system is housed for the best weight distribution

9. In later seasons, a 5.3-litre NA all-alloy 3UZ-FE V8 was used for weight and torque reasons, though it was restricted to 4.5-litres

10. The tune can be re-mapped to bring power on from 6000 to 8500rpm depending on the track

11. Billet strut tower brace holds the front-end apart during cornering and braking, keeping geometry intact



"THE ENGINE SITS BELOW THE RIMS AND BEHIND THE FRONT WHEELS, TURNING IT INTO A MID-ENGINE/REAR-DRIVE MACHINE."

1. The alternator is mounted under rear roll cage brace, just in front of the diff for weight distribution

2. Remote reservoirs for dampers

3. ATL dry break fuelling system prevents refuelling fires and rapidly increases refuelling times

4. Clear pipe is an oil breather hose

5. Transverse-mount in-board custom made coilovers on the cantilever architecture

6. Pumps and reservoirs for the dry sump system, power steering and more are in this compartment

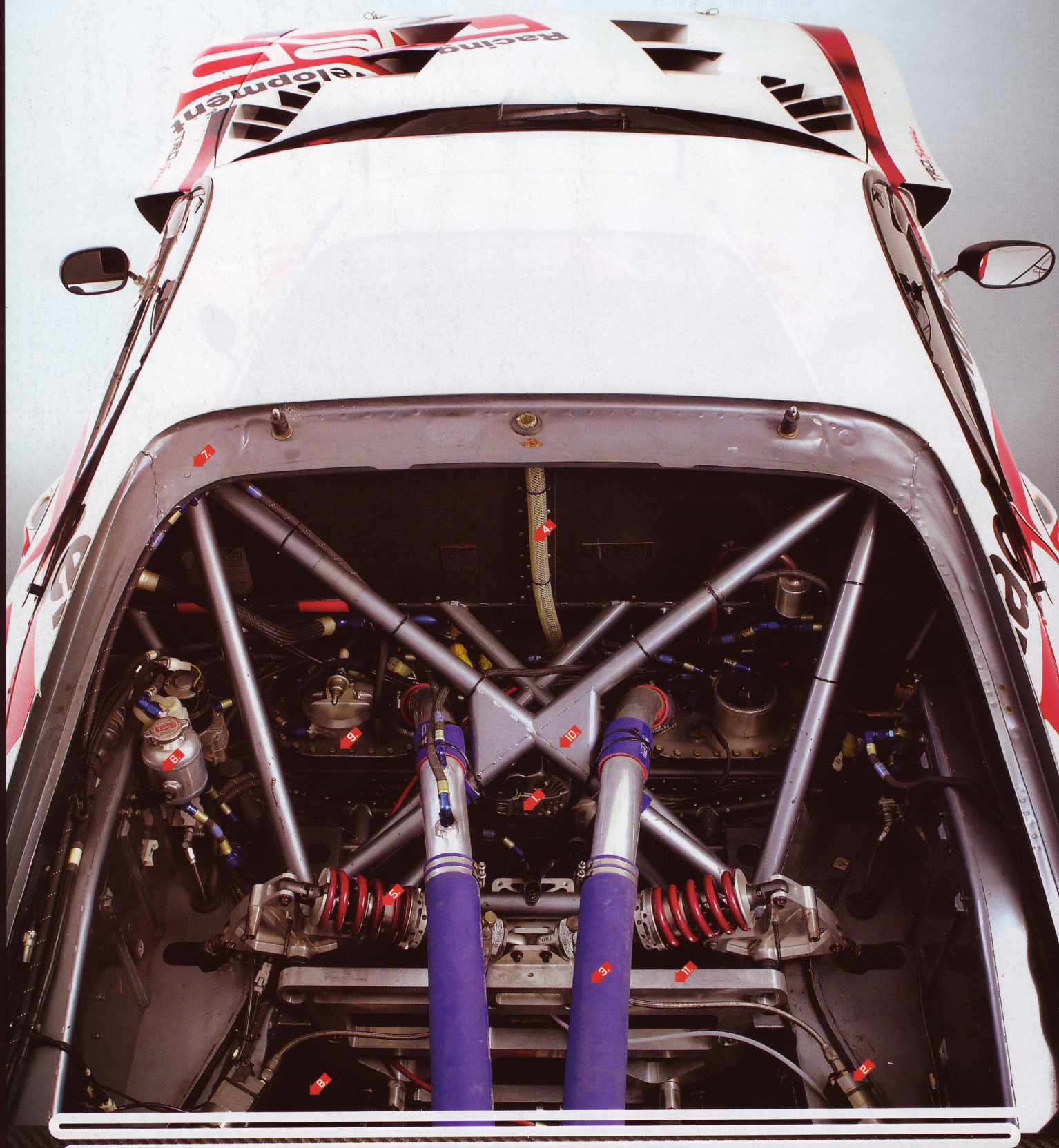
7. Hatch frame has been seam-welded and pinched for strength

8. The flat raw carbon floor continues under the hatch and passes under the fluid coolers at the rear

9. Regulations state twin 50-litre fuel cells for a total 100L capacity

10. Roll cage sections off and braces normally flaccid rear section of car, as well as providing an anchor point for rear suspension

11. Billet alloy rear cradle mount used for strength and weight



"THE CHASSIS HAS BEEN SEPARATED BY A MIX OF ROLL CAGE TUBING AND A FULL CARBON FIBRE FIREWALL.



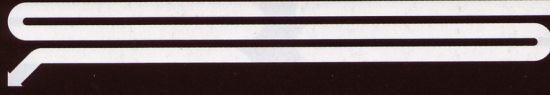
## CHASSIS

It is common knowledge that JGTC cars since the introduction of GT500 and GT300 classes have been based off tube frames, but it is astounding to see just how much extra work goes into these cars. For a start, this Supra shares only the roof, floor and pillars with the original JZA80 structure as the rest has been replaced with a tubular frame that incorporates the roll cage and suspension points into integral parts of the chassis. With the lightweight body and custom metal work, it now weighs 1100kg.

The front-end has been tubbed to allow the 19x13-inch front wheels, while all mating surfaces have been seam-welded and pinched and lipped for maximum strength and the massive GT-wing has been made a part of the chassis of the car to incorporate all the most stressed points. The front-end suspension architecture is all triangulated tubular frame for strength.

In the event of a collision, inside a GT500 car would be a very safe place to be, as the roll cage encapsulates the area where the driver's helmet would normally sit. Wrapping around in a curved design, the cage has been used to minimise the amount of movement available for the driver's head in a high-G crash, which can cause massive amounts of head trauma, leading to brain damage or even death.

Rather than the breezy open-plan effort Toyota had with the road-going JZA80, the GT500 car's chassis has been separated between the cabin and the rear "hatch" section by a mix of roll cage tubing and a full carbon fibre firewall. As the rear of the car houses potentially flammable liquids, it was sectioned off from the rest, and as a by-product the added cross-bracing has vastly improved the stiffness of the chassis, thereby helping braking and cornering immensely by reducing energy sapping flex.



## SUSPENSION AND DRIVETRAIN

Gearbox is a fully sequential six-speed from those legendary cog-manufacturers at Hewland. Celebrating its 60th anniversary this year, the English engineering company have been responsible for gearboxes and transaxle units (where the gearbox and differential is mounted as one unit) in some of the most famous racing cars ever to compete on racing circuits around the globe.

Mega-dollar custom developed in-board coilovers, featuring remote reservoir dampers mounted around 30cm away at each corner have been set out in a cantilever, double wishbone layout and solid-mounted using a billet alloy cradle at each end. The whole system has also been tied together using rose-joints instead of bushes, giving much more control and rigidity than can be attained by rubber or plastic bushing inserts.

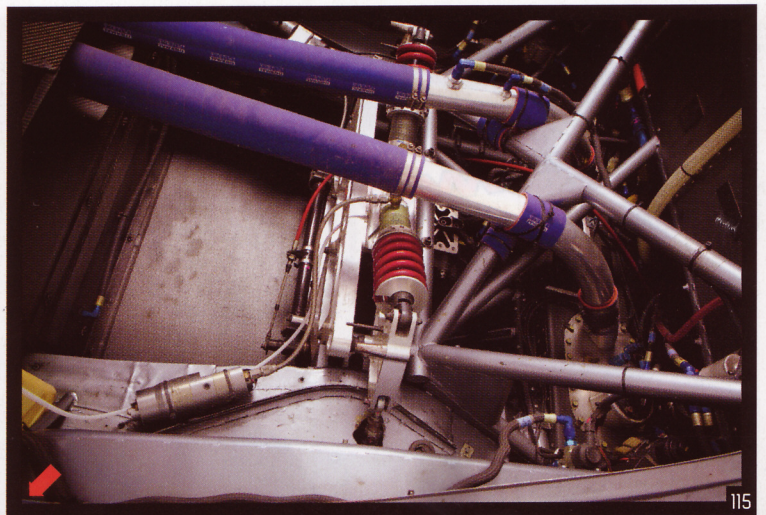
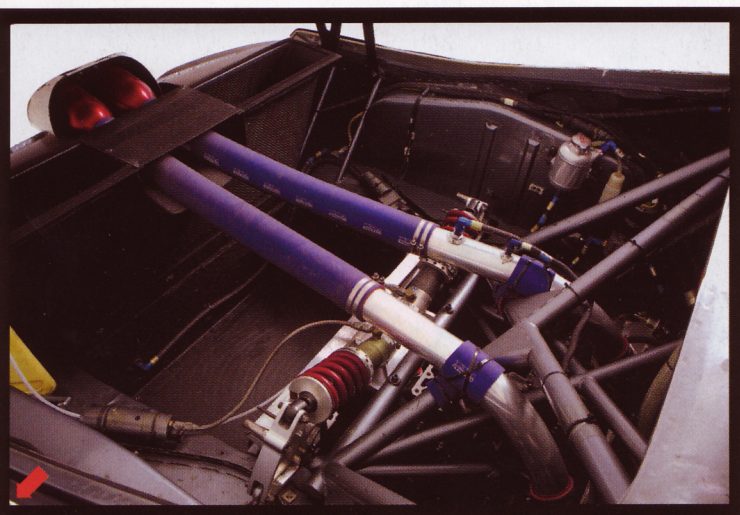
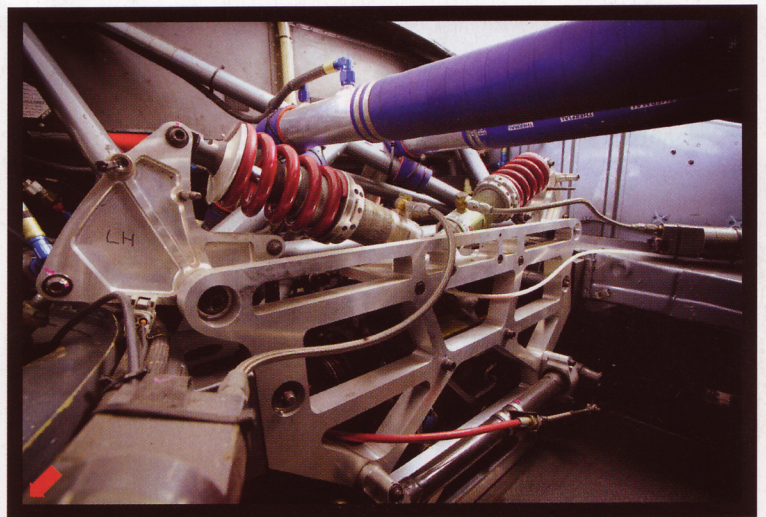
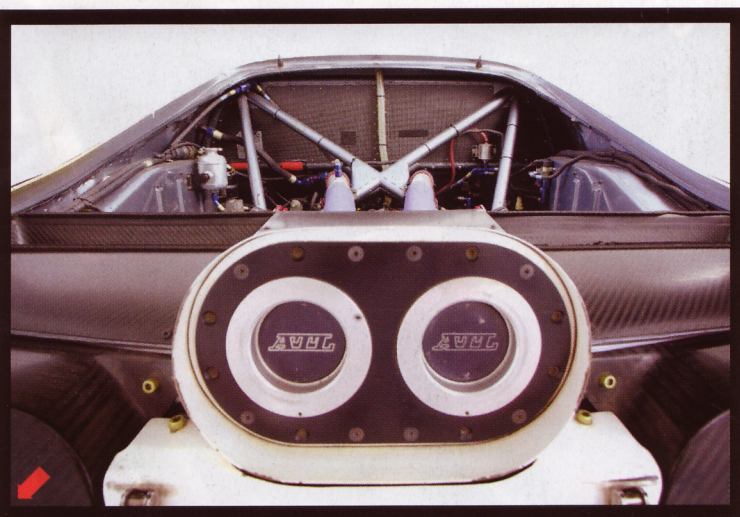
As the coilovers are wound up and down, they act on arms that connect to the wheels and the lower mount points, raising and lowering the vehicle and changing its spring rates. The inboard mounting reputedly gives better balance and control over undulations and bumps on such a rigid chassis, while their small size saves weight.

In the front is a KYB steering rack, while the power steering lines run to the rear hatch where the pump and reservoir lie, remote mounted to move the weight into the centre of the chassis. Sandwiched between the motor and that steering rack is a billet alloy front strut tower brace.

Down the back, the diff is solidly mounted to the chassis, using a block of billet alloy in an inversely mounted triangulated design, that is also braced off the roll cage mounts that affix to the top of the suspension mounts, making it a one-piece unit.

## RACE HISTORY

1994	no win / 5 race
1995	1 win / 6 race
1996	1 win / 6 race
1997	5 win / 6 race "Series Champion"
1998	no win / 7 race
1999	2 win / 7 race
2000	1 win / 7 race
2001	3 win / 7 race "Series Champion"
2002	3 win / 8 race "Series Champion"
2003	3 win / 8 race
2004	2 win / 7 race
2005	5 win / 8 race "Series Champion"





## BRAKES AND ROLLING STOCK

As you'd expect, the JGTC/Super GT cars run full-face slick tyres, and on the TRD JZA80, there are forged, lightweight 19-inch rims in front and 18-inch rims in the rear.

The 19s were used on the front for better steering response, while the 18s offer less rolling mass and more grip. Both pairs of wheels are 13-inches wide, and that girth is a direct result of needing as much grip as possible, while the slicks are Michelin 31/71s. Those numbers related to the tyres being 31cm (310mm) wide and having 71cm (710mm) rolling diameter.

While that is pretty formulaic for any serious track car, the braking hardware on GT500 JZA80 #26 is uber-exotic. We're talking England's finest on both ends, from the house of AP Racing. The multi-piece, slotted and ventilated rotors are switched from Alcon to AP racing depending on the race and conditions, while the callipers remain AP Racing at front and rear.

With the massive amounts of heat generated during braking, the six-piston front callipers and four-piston AP Racing rear callipers have to use liquid cooling to stop the pads and fluid from cooking, just like the tarmac set-up on WRC cars. At over \$10,000 per-corner it's not for the light of wallet and really overkill on anything that's not seeing the regular brake surface temps in excess of 800degrees Celsius like the GT500 cars.

As with the adjustable sway bars, the braking bias is also able to be altered by the driver on the fly thanks to the Tilton adjustable bias set-up. This normally happens in conjunction with the sway bars as the tyre grip, fuel load and track temperature change during the race, meaning that bias will need to be wound off the front to save tyre wear.

## CABIN

In the car, the tube frame roll cage snakes through the interior, limiting the amount of entry space for drivers, while the fantastically deep Recaro fixed-back bucket seat and intrusive crossed door bars add to the amount of contortion required to get in.

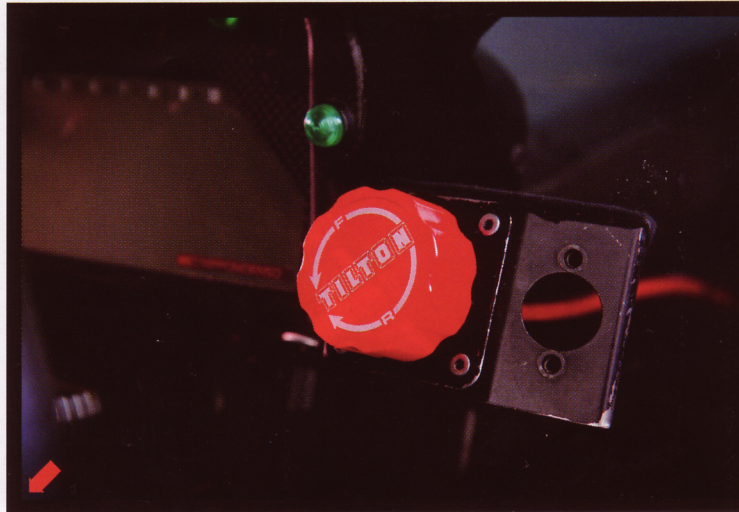
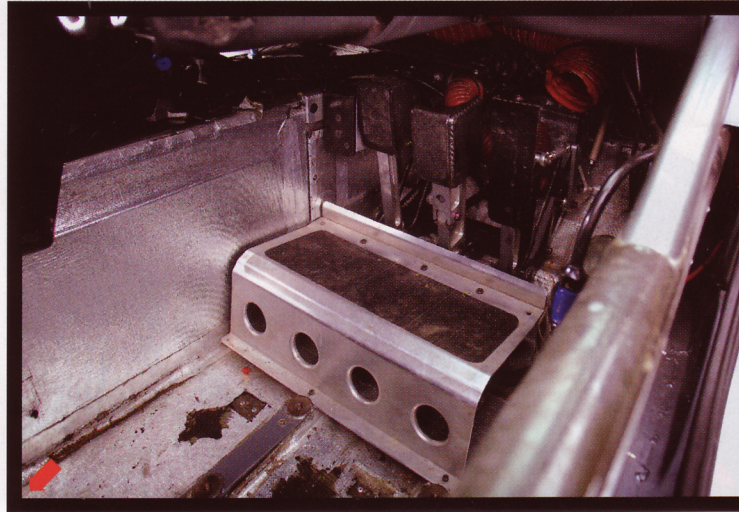
Because the motor has been mounted so far back in the engine bay the firewall, floorpan and transmission tunnel have been modified to fit the drivetrain and it makes do with simple flat edges in a rudimentary fashion that throws all thought of form out the window in favour of efficient function.

In the hot seat, the driver can choose several different boost levels and even ECU maps to suit fuel economy if needed (Super GT is an endurance-based racing series after all). The NipponDenso LCD digital dash shows RPM and instantaneous read-outs, with a row of LEDs above it as a bank of shift lights. Brake balance and sway bar stiffness can be adjusted from in-cabin, two important factors during an endurance race as fuel loads lighten during each driver's stint, throwing the weight balance out and affecting the braking and cornering characteristics of the car.

The steering wheel is not totally removable, but instead flips upwards and forwards onto the dashboard via a pull catch on base of the hub. The centre console is packed with switches oriented towards driver for ease of use at speed, while the passenger side has a bank of push-pull fuses.

Mounted to the floor is the mega-expensive Tilton pedal box, featuring carbon fibre pedals that can be adjusted to suit the driver's height. When you've got a pair of drivers per-car for each enduro, this always throws variables into the equation as they might be different sizes, so the pedals can be moved.

**50 YEARS OF MOTOR SPORTS**  
In 2007, Toyota have been celebrating 50 years of competing in various motor sports, from rallying, hill climbs, Formula One, Indy cars (and various other open-wheel series) to sports and touring cars, drag racing and even NASCAR in both the Craftsman Truck series (for pickups) and Nextel Cup. There's been plenty of wins, with driver's and manufacturer's titles in the World Rally Championship and domestic sports cars, while Rod Millen's Unlimited Class Celica still holds the record for fastest time up the famed Pikes Peak International Hill Climb, some 14 years after he set it!



1. Tilton adjustable brake bias dial is used as race progresser and tyre wear and fuel load alter car's braking characteristics

2. NipponDenso digital dash displays multiple real-time readouts

3. Steering wheel flips up to allow access to the tiny driver's compartment thanks to small pull tab under the boss

4. Tilton pedal box features exotic carbon fibre pedals and is adjustable

5. Driver's Recaro bucket is heavily reclined, with the base sitting at a 45-degree angle to the floor

6. Shift lever is large and imposing in the cabin, and requires a forceful effort to move either forward or back

7. Smaller black lever is used to select neutral in the Hewland six-speed sequential 'box

8. Dials and switchgear is marked in English, something that is odd considering it is a race car from Japan, for Japan

9. Blue and red levers are adjustment levers for sway bars

10. Dashboard intrudes into cabin because motor has been rear-mounted for better weight distribution



"MOUNTED TO THE FLOOR IS A MEGA-EXPENSIVE TILTON PEDAL BOX, WITH ADJUSTABLE CARBON FIBRE PEDALS.

## SPECIFICATIONS

### OWNER

TRD Japan

### RIDE

TRD/Toyota Technocraft JZA-80

Supra

### ENGINE

Toyota 3S-GT turbocharged 2.0-litre in-line four-cylinder

### ENGINE MODIFICATIONS

Dry sump lubrication, custom pistons, custom connecting rods, twin fuel-pressure regulators, twin 50-litre fuel cells, custom turbocharger, 43mm intake restrictor, flat-mounted Denso air-to-air intercooler, V-mount Denso radiator, twin fuel cells

### DRIVELINE

Hewland six-speed sequential gearbox, solid-mounted diff, rear-wheel drive

### SUSPENSION AND BRAKES

Tubular chassis (incorporating roll cage), tubed front-end, seam-welded chassis, double wishbone layout, inboard coilover struts (with remote reservoir dampers), solid-mount billet alloy rear cradle, KYB steering rack, in-cabin adjustable sway bars (front and rear), billet alloy front strut tower brace, AP six-piston calipers with liquid cooling, multi-piece AP or Alcon slotted and ventilated rotors (front), AP four-piston callipers with liquid cooling, multi-piece AP or Alcon slotted and ventilated rotors (rear), Tilton adjustable bias

### WHEELS/TYRES

19x13-inch forged racing wheels (front), 18x13-inch (rear), Michelin 31/71 full-face slick

### INTERIOR

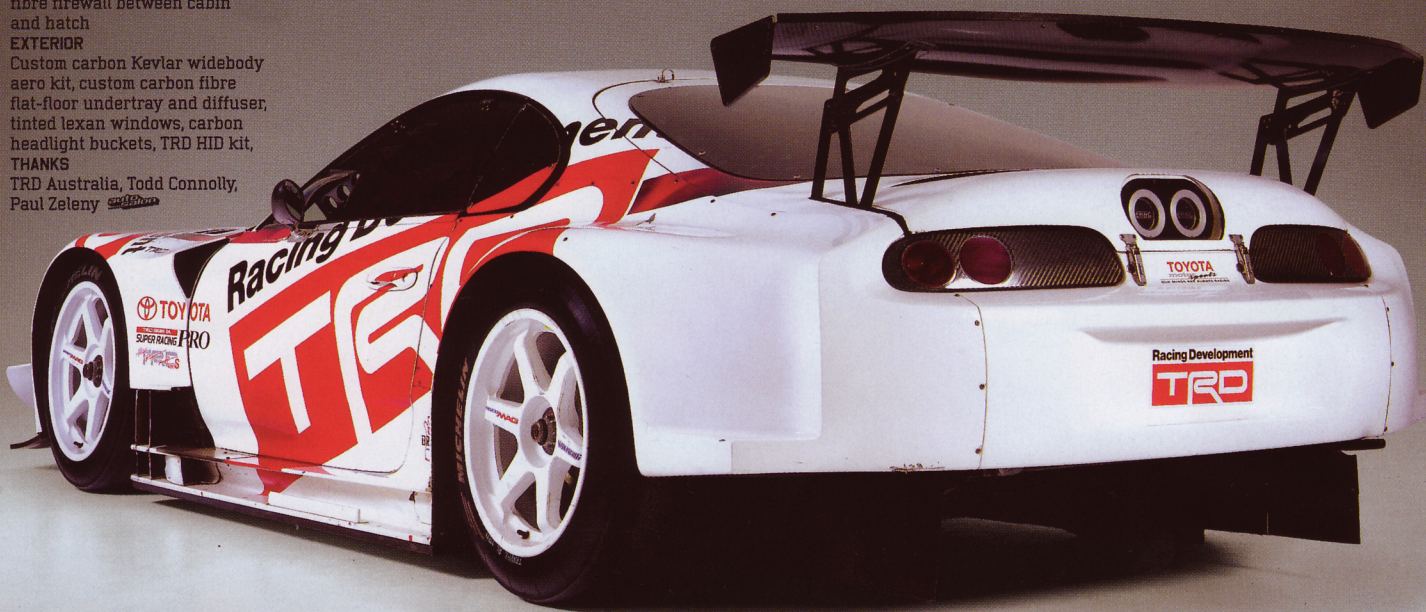
Recaro single-piece bucket seat (driver), Bride single-piece bucket seat (passenger), Takata driver harnesses, Sabert passenger harnesses, custom dash, tilt steering wheel, Tilton carbon fibre pedal box, carbon fibre firewall between cabin and hatch

### EXTERIOR

Custom carbon Kevlar widebody aero kit, custom carbon fibre flat-floor undertray and diffuser, tinted lexan windows, carbon headlight buckets, TRD HID kit,

### THANKS

TRD Australia, Todd Connolly, Paul Zeleny



"BETWEEN 1994 AND 2005, THERE WERE 26 VICTORIES FOR GT500 SUPRAS IN JGTC ACROSS A NUMBER OF TEAMS."