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BRIAN'S NISSAN SKYLINE GT-R

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BRIAN'S NISSAN SKYLINE GT-R



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THE PINNACLE OF THE RB26DETT ENGINE

The basic design of the famous RB26DETT six-cylinder in-line twin-ceramic turbo engine remained the same from its birth in 1989 until it was replaced in 2002. However, several components were updated along the way to improve performance.

The RB26DETT type engine that debuted with the Skyline GT-R (R32) in 1989 had specifications of a maximum output of 280ps/6,800rpm, maximum torque of 36.0kgm/4,400rpm, and a rev limit of 8,000rpm. The prototype is said to have exceeded 300hp, but together with the Fairlady Z (Z32) – which was released a little earlier – it settled on the self-imposed limit of 280hp.

The RB26DETT type had an orthodox design, including the Skyline GT-R series' traditional six in-line cylinders and cast-iron cylinder block. The four-valve DOHC cylinder head did not have a complex variable valve timing mechanism or variable intake mechanism. It was generously equipped with top-quality parts for a production car such as six-throttle valves and a large-capacity air-cooled intercooler that would be effective when converted to a Group A machine. The engine was technically impressive from the start, but continued to evolve with each full model change, while maintaining its basic design.

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THE PINNACLE OF THE RB26DETT ENGINE



The Skyline GT-R underwent a full model change in 1995 and became the R33 model. The battery, which is one of the heaviest items in the engine compartment, was moved to the rear of the vehicle. The basic structure of the engine was the same but slightly more powerful, and the ECU computer evolved from 8-bit to 16-bit to speed up operation processing speed.

When the GT-R underwent an upgrade to become the Skyline GT-R (R33) in 1995, the maximum output of 280hp remained the same. However, the maximum torque was boosted from 36.0kgm in the previous Skyline GT-R (R32) to 37.5kgm, a substantial step up in power. The increase principally came from increasing the turbo's maximum boost pressure from 0.77kg/cm^2 to 0.82kg/cm^2, plus through several other changes.

There were no major changes to the engine compartment layout, except that the battery was moved to the back of the trunk. There were also no alterations to the engine body, including the design of the black rocker cover, which followed that of the previous model.

Meanwhile, the intake system used a newly designed lightweight resin air cleaner box to reduce intake resistance, while the turbo was the same twin ceramic type as in the Skyline GT-R (R32).

UPGRADED EXHAUST AND ENGINE CONTROL UNIT

For the large-capacity air-cooled intercooler that cools the intake air pressurized by the turbo, a fin type was adopted. The conventional core – which is called the multi-hole tube type – was made of stacked aluminum sheets with numerous holes, and had a reasonably thick interior. On the other hand, the inner-fin type was a 0.1mm (0.004in) thick aluminum fin with a 1.4mm (0.055in) pitch wave shape, wrapped with an aluminum sheet and brazed at all joints.

As a result, this increased the heat dissipation from 16,800kcal/h to 17,500kcal/h of the previous generation, lowering the air intake temperature and reducing weight. The lightweight air-cooled intercooler reduced the weight of the front overhang – this was directly linked to reducing the yaw moment of inertia, which was related to vehicle maneuverability.

Reducing exhaust resistance is also important for increasing power, but is also likely to increase exhaust volume. A newly developed exhaust system was adopted to balance these conflicting actions. The rear muffler was expanded from 16L to 19L and the internal structure of the muffler was ingeniously designed to allow exhaust gases to flow smoothly, reducing both exhaust noise and exhaust resistance. Additionally, the diameter of the two front tubes immediately in the lower reaches of the twin ceramic turbo was increased from ϕ54mm to ϕ60.5mm, while the dual tail pipes contributed to reduced exhaust resistance.

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Although the Skyline GT-R (R33) had a larger body than the R32, its performance exceeded that of its predecessor, as displayed by the Nürburgring lap time being reduced by 21 seconds. It was a Skyline GT-R with plenty of interior space and excellent for everyday use.

The fan for radiator cooling was changed from a conventional eight-fin to a nine-fin composite reversing blade type unequal pitch fan, which also reduced noise.

With track driving in mind, the control of ignition timing and the fuel/air mixture ratio must be fast and accurate even under harsh conditions, where the throttle is switched on and off in 0.1 seconds. The ECU (engine control unit) that controls the engine evolved from the previous generation's 8-bit version to 16-bit in the Skyline GT-R (R33); it boosted the processing speed and provided a stable, linear power response that faithfully responded to the driver's intentions. In addition to increased torque, more control over the power was achieved.

Incidentally, this generation of the RB26DETT type was also installed in the special edition station wagon Stagea "Autech Version 260RS" (WGNC34).

IMPROVING THE TURBO AND IGNITION

The Skyline GT-R (R34) that appeared in 1999 was equipped with the final version of the RB26DETT type engine. The logo on the rocker cover was changed from "NISSAN TWIN CAM 24 VALVE" to "SKYLINE GT-R NISSAN."

The RB26DETT had been fitted in the previous two generations of the Skyline GT-R, during which time, its durability was refined through racing activities. It improved to achieve greater power performance and sharper response than the previous engine.

The turbo was a newly developed, high-efficiency ball-bearing ceramic unit. The combustion limit was improved by reviewing the shape of the compressor and turbine blades, and the maximum boost pressure was increased from 0.84kg/cm^2 of the previous generation to 0.93kg/cm^2.

In 1997, an RB26DETT engine as used in the Skyline GT-R (R33) was fitted to the WC34 type of the Stagea "Autech version 260RS" (WGNC34). The chassis was also tuned to match that of the Skyline GT-R (R33).



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THE PINNACLE OF THE RB26DETT ENGINE



In 1999, the last of the second-generation GT-Rs, the Skyline GT-R (R34), was introduced. Although the RB26DETT, which is the heart of the model, was modified, the output remained the same. Maximum torque was increased and response was greatly improved, resulting in the final iteration of the RB26DETT engine.

Furthermore, the air-cooled intercooler was made thinner to reduce ventilation resistance, resulting in an increase in maximum torque from 37.5kgm/4,400 rpm to 40.0kgm/4,400 rpm, while maintaining maximum output of 280hp. Additionally, the use of ball bearings in the bearings section improved response across the area.

At the same time, the valve timing settings matched to the turbocharger's characteristics to achieve a sense of extension at high revs that seemed to last forever. The exhaust was changed from stainless-steel casting to a stainless-steel pipe to reduce weight and smooth the flow of exhaust gas emissions; it contributed to increased torque. Additionally, by lowering the mounting position of the intercooler, the cooling airflow of the radiator was increased, resulting in more stable cooling.

In order to increase the maximum torque inside the engine, the connecting rod was made of kelmet-based material, which is used in Group C cars and GT1 machines. In the previous generation Skyline GT-R (R33), this was only used in the V·spec N1 model. The revised rod had excellent load resistance, which further improved durability.

Additionally, by adopting an ignition coil with a built-in power transistor installed in each cylinder, the power transistor unit at the rear of the rocker cover ornament was eliminated – this streamlined the ignition system, improved reliability, and reduced weight. The weight of the timing belt cover was also reduced by overhauling the materials used for each part, such as changing from aluminum casting to resin.

It's worth noting that the RB26DETT type engine installed in the Skyline GT-R models from 1989 to 2002 can still maintain high performance through overhaul and adequate maintenance. This is the case today, more than 30 years after the power plant's introduction, due to its excellent basic design, robust cylinder block capable of 600hp in Group A specification, and highly compatible parts. ♦

The body was downsized from the previous generation Skyline GT-R (R33), giving it a sharper design. However, from this period, collision safety measures and other factors made the Skyline GT-R (R34) slightly heavier than its predecessor. Nevertheless, it made up for this with improvements to the engine.



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NITROUS OXIDE – FIRE IN THE ENGINE

Nitrous oxide is a pressurized liquid that, when it enters the engine's cylinders, causes a chemical reaction that increases the vehicle's power. Its use in a very close race can mean victory, as long as the driver is cool-headed enough to know exactly when he or she has to activate it.



In the *Fast & Furious* franchise, nitrous appears as a basic element among those taking part in urban races. It is even mentioned when describing certain drivers, as Sergeant Tanner of the LAPD does when, in *The Fast and the Furious,* he says that "Toretto has nitrous oxide in his blood and a gas tank for a brain."

No matter how fast an automobile is, drivers know that instaling a nitrous oxide kit makes it possible to gain horsepower without having to modify the engine. And that can make the difference when accelerating to the max to reach the finish line first. But using it is risky. Harry, the owner of The Racer's Edge spares shop, tells Brian this when he is about to install a nitrous system in his Mitsubishi Eclipse. "Amateurs don't use nitrous oxide," he says. "I've seen how you drive. You've a heavy foot. You'll blow yourself to pieces."

As the characters in the *Fast & Furious* saga demonstrate, nitrous oxide is a great ally for experienced drivers.

NITROUS IN RACES

Nitrous oxide was discovered in 1771 by the British philosopher and

chemist Joseph Priestley when he heated ammonium nitrate in the presence of iron filings. The gas had various applications until the years after the Second World War, when it began to be used in racing cars. In the 1970s, drivers Mike Thermos and Dale Vaznaian found the right way to use it without running risks, and they founded a company called Nitrous Oxide Systems (NOS). This is precisely the system that Brian installs in the Mitsubishi Eclipse the first time he faces Dom Toretto, and which leads another driver called Edwin to exclaim: "He's got enough NOS in there to blow himself up. Period."

When the valves that release it are activated, the nitrous travels to the cylinders, where it mixes with two more elements: oxygen and fuel. Due to the high temperature of the engine, the chemical components of the nitrous (two nitrogen atoms and one of oxygen) separate. This causes a sudden increase in oxygen in the cylinders and enables combustion to materialize in a more violent explosion, which makes the vehicle go faster.

MAXIMUM ACCELERATION

In *The Fast and the Furious*, Brian turns up with two bottles of nitrous for his first race. The first one helps him to claw back positions after a bad start, and with the second one he tries to overtake Toretto's Mazda RX-7, which is in the lead. But Dom holds off the attack and activates his own nitrous, managing to win. "You're lucky that 100-shot of NOS didn't blow the welds on the intake," Dom says to Brian afterwards.

The characters in the world of *Fast & Furious* are experts in the use of nitrous. So much so that, apart from using it to help them win a race, they also use it to convert their vehicles into incredible projectiles, either to board a boat that has already set sail, as Brian does in *2 Fast 2 Furious;* or even to bring down a helicopter, a maneuver that Dom comes up with at the end of *Furious 7*. ♦

THE ADVENTURES OF BRIAN O'CONNER

His picture in the papers

Brian feels uneasy when he sees that his picture is in the newspapers. "Undercover Cop Still Missing" is the headline of a three-column news item. Only one other customer, a woman who is sitting right opposite him, notices his discomfort and observes how Brian chooses to sneak out when a sheriff and his assistant enter the diner to have a coffee.



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DEVELOPING A 1,000HP ENGINE

In a quest to compete against the best Group C cars, Nissan designed its first pure racing engine for two decades with the VEJ30 in 1987. It was good, but not quite good enough, so in 1989 a new unit was released with astonishing power levels – the VRH35.



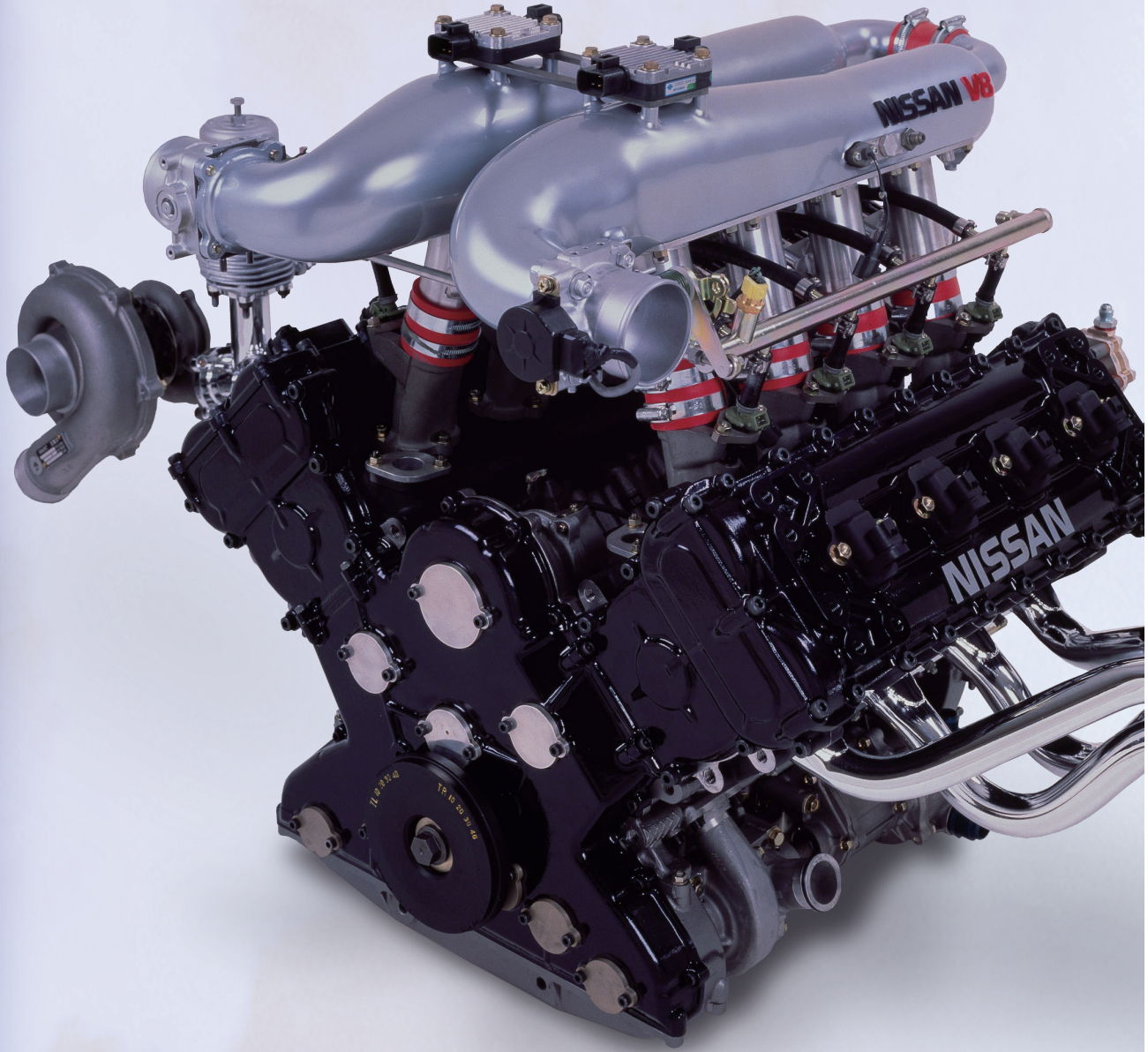
The R88C of Masahiro Hasemi and Aguri Suzuki at the 1988 Fuji 500km race. This Group C car was equipped with the VRH30 engine, an improved version of the VEJ30.

Nissan's Group C cars had been based on mass-produced engines with race tuning, but in 1987, the company developed and introduced a fully-fledged race-specific engine. This was Nissan's first race engine since the GRX-3 installed in the R382 race car in the 1960s.

The VEJ30 was a 3.0L four-valve DOHC twin-turbo V8 engine with significantly improved performance compared to the mass production-based VG30 turbo. However, it could not compete at the top level in domestic races because of its poor fuel economy, durability, and reliability. In 1988, the VRH30 engine, an improved version of the VEJ30, was introduced.

The VRH30 was mainly improved in the cylinder head area, where the large valve pinch angle

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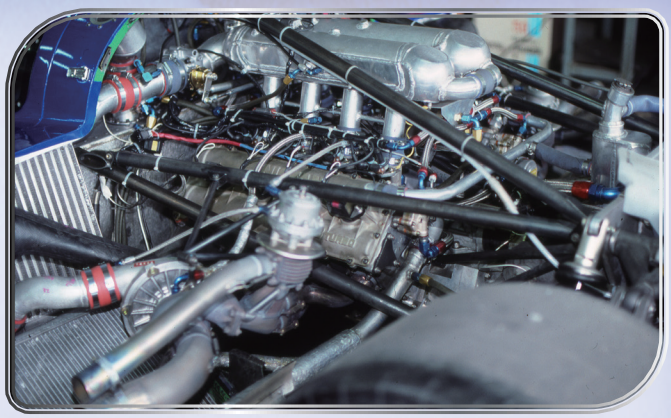
of the VEJ30 was reduced to make the combustion chamber more compact. At the same time, the cooling performance of the combustion chamber area was improved. The swing-arm type valves were replaced by direct-acting valves driven directly by the camshaft, simplifying the mechanism. The fuel system was also enhanced, with two injectors per cylinder. This improved fuel atomization and economy.

On the other hand, the cylinder block had a bore and stroke of 85.0 mm x 66.0mm, the same spec as the VEJ30, and the displacement was the same at 2,966cc. As a result, the engine's performance and reliability were improved, but fuel consumption remained an issue; although the unit made the race cars more competitive, it was still not good enough for them to win the Championship.

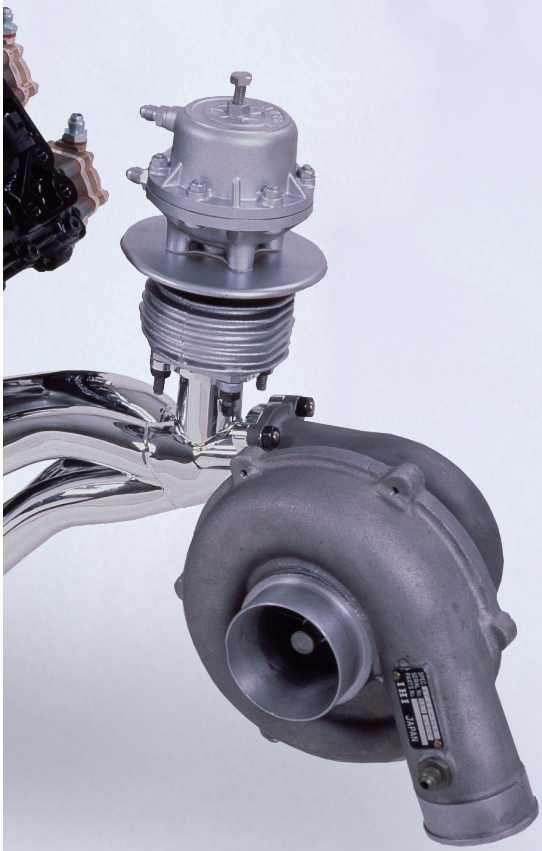
The following year, 1989, was when Nissan delivered a strong challenge at the top level. The

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Introduced in 1989, the VRH35 engine was the basis of the most powerful race engine ever fitted into Nissan's Group C cars.



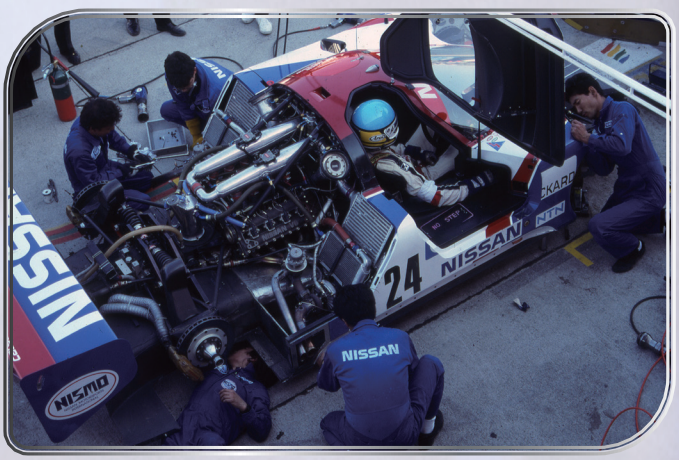
Compared to the VEJ30, the head on the VRH30 had a narrower distance between the two camshafts. To improve fuel economy, the valve pinching angle was reduced to create a compact combustion chamber shape.



chassis on the Group C model was changed from the March frame to a Lola chassis, and the R89C was designed with aerodynamics and cooling performance in mind for the 24 Hours of Le Mans. A newly developed VRH35 engine with a displacement of 3.5L was also introduced. Based on the



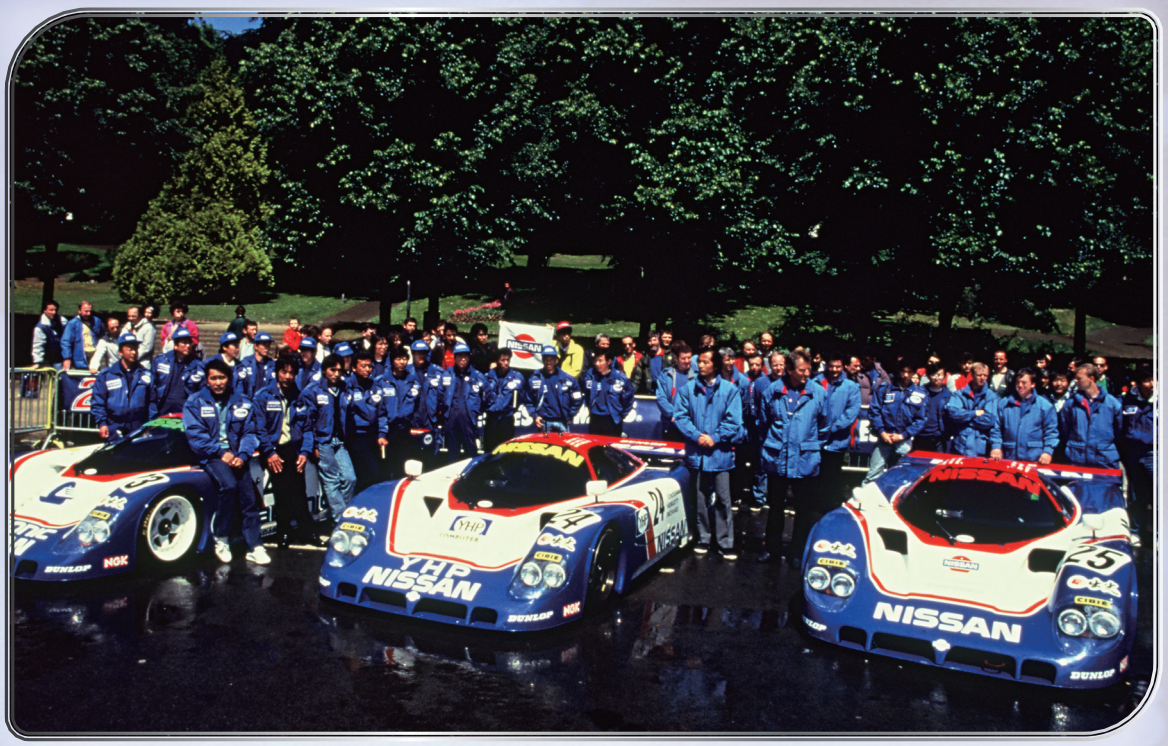
Kazuyoshi Hoshino and Toshio Suzuki's R89C at the 1989 Fuji 500-mile race. It was powered by a newly designed VRH35 engine with improved aerodynamic performance.



The R89C of Masahiro Hasemi and Anders Olofsson, which competed in the 1989 Suzuka 1,000km race. The rear cowl is removed to reveal the VRH35 engine.

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DEVELOPING A 1,000HP ENGINE



At the 1989 24 Hours of Le Mans, Nissan took on the challenge in earnest and entered three R89C cars. Unfortunately, they all retired.

experience gained up to that point, the main dimensions and displacement of this newly designed engine were completely updated, and its performance and reliability were greatly improved.

Nissan entered three R89Cs in the 1989 24 Hours of Le Mans. In qualifying, the foreign crew of Car 24 (J. Bailey, M. Blundell, and M. Donnelly) placed 12th, Car 25 (G. Brabham, C. Robinson, and A. Luyendijk) placed 15th, and the Japanese crew of Car 23 (Masahiro Hasemi, Kazuyoshi Hoshino, and Toshio Suzuki) placed 19th, Expectations were high for the race. However, all three cars ended up retiring due to a lack of reliability despite the speed of this year's car. Nevertheless, it was clear that the VRH35 engine had enough speed to compete on the world stage, and it raised high hopes for the following year's Le Mans.

The VRH35's maximum output during qualifying exceeded 1,000hp, and it was the driving force behind the significant increase in the Nissan Group C car's competitive power. The upgraded version, the VRH35Z, was heralded as the most powerful Group C engine ever built. ♦



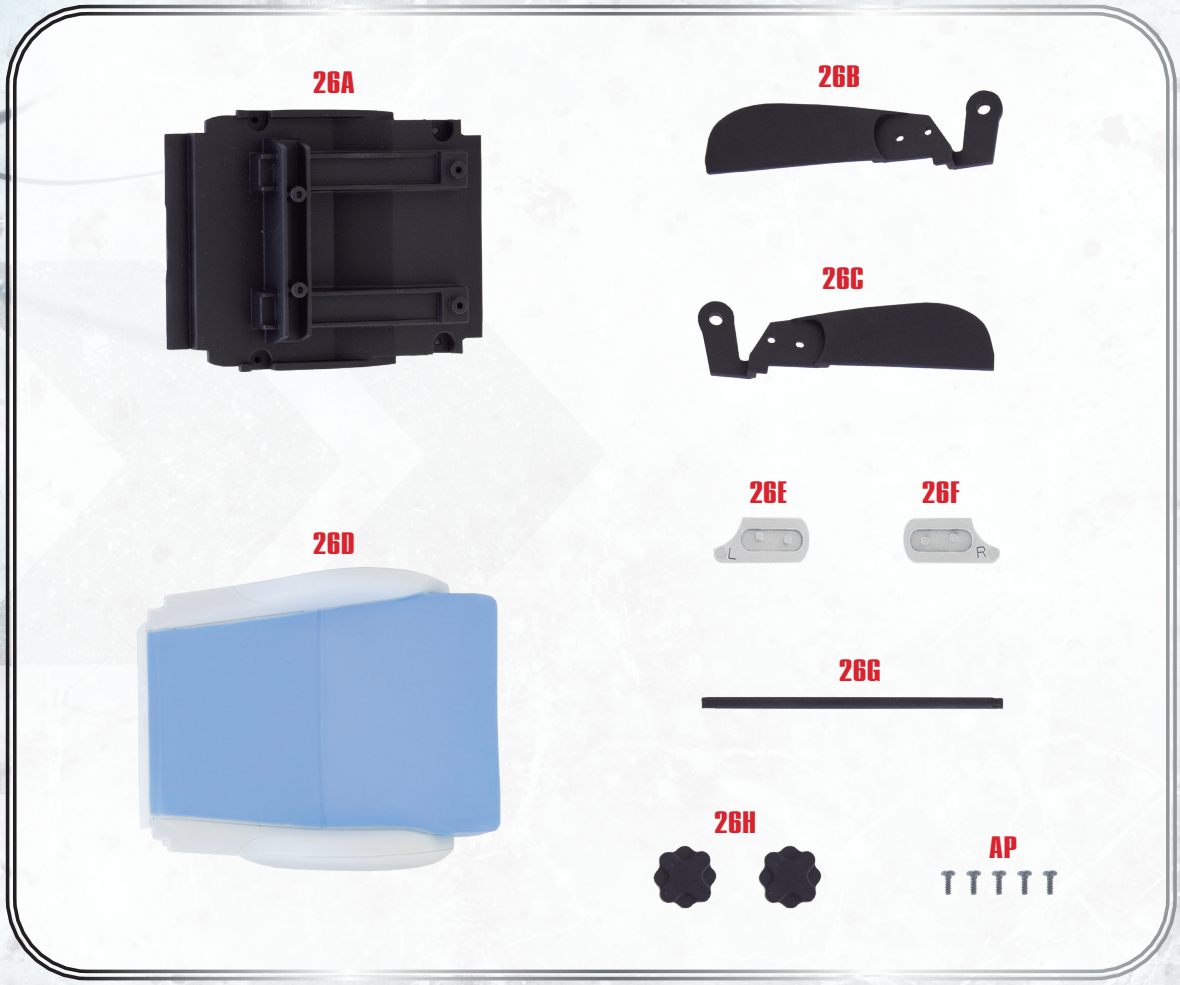
At Le Mans in 1989, Car 23 was driven by three Japanese drivers. The photo was taken during the qualifying round, where the car finished in 19th position.

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STAGE 26
DRIVER'S SEAT (2)

In this issue, we will mount the upholstery on the base of the driver's seat and then attach this to the backrest assembly.

PARTS



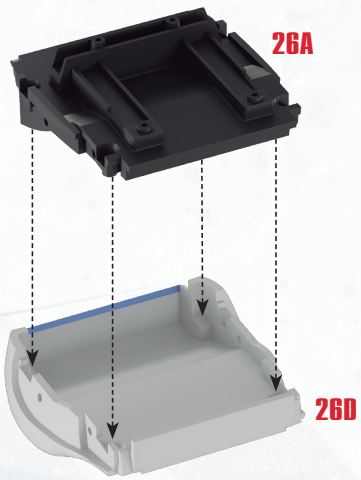
26A Driver's seat base
26B Left-side panel of the driver's seat base
26C Right-side panel of the driver's seat base
26D Driver's seat base upholstery
26E Driver's seat base left-side trim
26F Driver's seat base right-side trim
26G Driver's seat reclining shaft
26H Driver's seat reclining knobs (×2)
AP Screws 1.7×4mm (×5*)

*Including spares

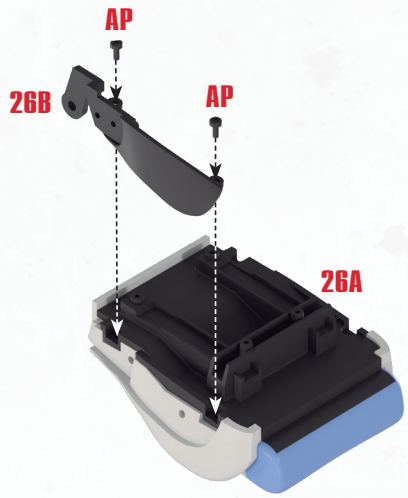
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DRIVER'S SEAT (2)

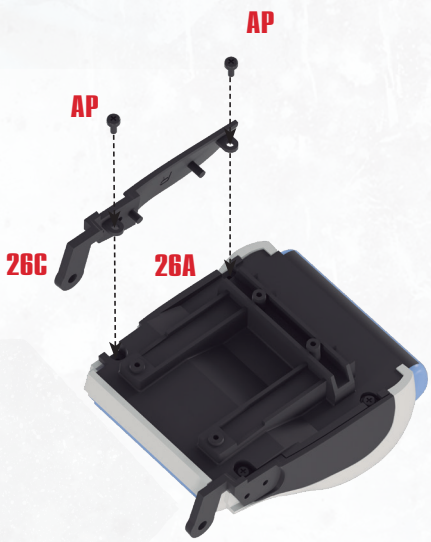
26.01 Fit the driver's seat base **26A** into the interior of the driver's seat base upholstery **26D**.



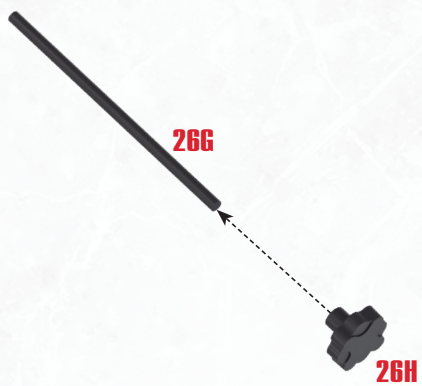
26.02 Insert the left-side panel of the driver's seat base **26B** into the holes in the left side of the bottom of the seat base **26A**. Fix the parts with two **AP** screws.



26.03 Insert the right-side panel of the driver's seat base **26C** into the holes in the right side of the bottom of the seat base **26A**. Fix the parts with two **AP** screws.



26.04 Attach a driver's seat reclining knob **26H** to the end of the driver's seat reclining shaft **26G**.



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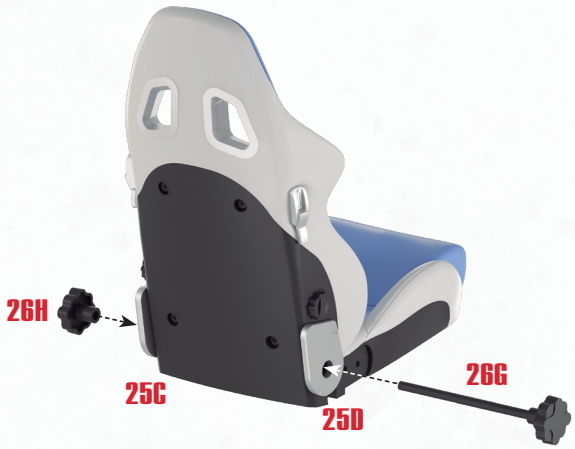
26.05

Retrieve the driver's seat backrest that you assembled in issue 25 and align the bottom of the backrest 25A with the rear flaps on the right- and left-side panels of the seat base, 26C and 26B.



26.06

Insert the reclining shaft 26G through the recline backing plates 25D and 25C. Then attach the other reclining knob 26H to the free end of the reclining shaft 26G.





26.07

Attach the driver's seat base left-side trim 26E to the left side of the driver's seat base 26B.

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26.08

Finally, attach the driver's seat base right-side trim **26F** to the right side of the driver's seat base **26C**.



Final assembly



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