



The Engineering Revolution: How Toyota Made “The Best Car In The World”

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In 1983, Toyota president Eiji Toyoda challenged his company to build “a car that is better than the best in the world.” It was a remarkable ambition, and there were many in the automotive world ready to dismiss the idea as fantasy. After all, how could a business with no experience of the international luxury car market have any hope of matching, let alone exceeding the achievements of the industry’s established leaders? Even within Toyota there were doubters who said his plans were simply impossible.

The doubters were all proved wrong. Thanks to the inspiration and utter dedication of the people behind the “Circle F” project – that’s F for Flagship – the Lexus LS 400 was born. It’s a car that history now recognises as a landmark model, a revolutionary disruptor that redefined what luxury motoring was all about.

Setting the targets

Circle F was a top-secret project, with more than 4,000 people involved in bringing it to fruition. Right from the start, the targets set for the LS were exceptional. Its top speed had to be 155mph, yet it would deliver 27mpg. Its aerodynamic styling would have a drag coefficient of no more than 0.29, and when cruising at 62mph, the noise level in the cabin would not exceed 58dB.

To put those figures into context, the LS would be faster, quieter, more aerodynamic and more fuel-efficient than any of its German rivals. Each goal on its own was ambitious; for them all to be achieved together seemed an impossibility.

What made the task all the more difficult was that Toyota had never built anything like the LS before. A master of mass-market models driven by millions of people around the world, it was entering completely new territory. Fortunately, rather than being intimidated by the scale of the task, there were key people eager to meet the challenge.

The Relentless Pursuit of Perfection – a phrase that came to define Lexus – had begun.

Chief Engineer Ichiro Suzuki: no compromise

The driving force behind the LS 400’s development project was Chief Engineer Ichiro Suzuki, a man who was not prepared to compromise, even when members of his 1,400-strong engineering team told him what he wanted could not be done.

So ambitious were Suzuki's plans, Toyota's director of product engineering himself, Akira Takahashi, told him he was out of his mind and initially declined to be involved

Takahashi explained that even though the company had the best production equipment in the world, that still wouldn't be enough to create the car Suzuki envisioned. For example, no Toyota other than the Supra sports car could go faster than 110mph. Suzuki was not to be denied, and refused to leave his colleague's office until he agreed to make at least one engine.

"I couldn't compromise," he said, "If I did, then it would be just a normal vehicle."

The roots of Lexus's "yet" philosophy

Takahashi's belief was that comfort and performance could, or rather must co-exist in a single vehicle, a car that is calming yet also invigorating to drive. This ability to bring together seemingly conflicting qualities to excellent effect is a core value of Lexus – what's known as the "yet" philosophy.

Here's how it influenced the key qualities of the LS 400:

- Superior high-speed handling, yet comfortable to travel in
- Fast, yet fuel-efficient
- Very quiet, yet lightweight
- Elegantly styled, yet aerodynamic
- A warm, appealing interior, yet highly functional
- Find the source, solve the problem

Chief Engineer Takahashi knew that meeting the LS's high targets called for a complete conceptual shift from Toyota's established engineering norms and he instructed his team to reassess everything that might limit the car's performance by going back to the source – a process known as *genryu-shugi* in Japanese.

They went to unprecedented lengths to solve every issue. For example, much time was spent trying to identify the source of one particular noise from the drivetrain. It was eventually traced to an irregularity in the shape of the driveshaft that caused vibration and a noise that grew louder as the shaft's rotation speed increased. Rather than use secondary measures to combat the problem, the solution – applying the *genryu-shugi* principle – was to make the driveshaft from a different, high-tensile steel.

Discovering the meaning of luxury

When the Circle F project was formed, Toyota already had a "luxury" vehicle for the Japanese market, the Century. But right from the start it was clear that it was not the kind of car that could compete in the global market.

The project team had to learn what luxury meant to international customers. What did they look for in a premium car and how did it fit their lifestyles? Speaking to focus groups, exploring the lifestyles of their target customers and analysing the marketplace, they were able to distil the key qualities needed for success. What they learned surprised them.

Their research revealed that the top priority for American customers was a prestigious image; performance was considered only the fourth most important quality. This was going to be a tough battle to win against the established market players, but there was no let-up in the programme.

The Art of Balance

The LS called for both a new vehicle platform and a new engine - a four-litre quad-cam V8 all-aluminium unit that produced 241hp. As with every other aspect of the car, intensive efforts were invested to make sure the engine was exactly in every detail - 973 prototypes were created.

The engine was every bit as smooth and refined as Suzuki had hoped, a quality captured in Lexus's first television ad, the famous "*Art of Balance*." A pyramid of champagne glasses is built on top of the LS's engine as the car accelerates on a rolling road towards 150mph. The glasses do not move and are filled with Champagne, with not a drop spilled.

Simple, clean, smart

Beauty is in the eye of the beholder, but the new LS couldn't afford to deter customers if the look was too radical, or too ordinary. This meant conforming to a degree with the familiar, square-ish lines of the established luxury market models, while breaking new boundaries in terms of sleek, aerodynamically efficient styling - aerodynamics being key to both fuel efficiency and handling.

Dozens of wind tunnel tests were conducted, with cars fitted with interior microphones to pick up any intrusive wind noise. The commitment to excellence continued, 14 full scale models were built in a 16-month period, compared to around just six for most new cars.

"Simple, clean, smart" were the watchwords for the styling, giving the LS the reassuring mass of a European car, combined seamlessly with the sleekness of a Japanese model. The final design was signed off in May 1987.

Interior precision

The cabin design was rigorous in its attention to craftsmanship detail, from the fine leather upholstery and the choice of wood for the trims (24 different varieties were assessed). This was not just reinforcement of what customers expected of a luxury car, there was innovation, too. For example, in creating the instrument panel, designer Michikazu Masu went against the modern trend for digital displays and instead came up with a new take on analogue dials, making each needle an individual fluorescent tube - miniature "light sabres" that lit up before the rest of the instrumentation.

2.7 million miles of testing

The new LS had to prove that it delivered on its promises, not just in isolation, but in the context of the vehicle as a whole. It was time for the car to hit the test track - Toyota's 16-mile Shibetsu proving ground. The thoroughness was breathtaking: 450 test cars were built and between them they covered more than 2.7 million miles. The track featured every kind of road surface the car would encounter in the real world, from rough tracks to super-smooth highways.

It took time, but the targets were met: Circle F proved the impossible could be made possible.

The name and the reveal

After taking the big decision to create a new brand name for the LS - this was not to be another Toyota - plans we made to reveal the car at the 1989 North American International Auto show in Detroit. The name Lexus was chosen and the Lexus LS 400 made its debut to huge acclaim. The positive response of industry media and experts was matched by public enthusiasm: sales met the

ambitious targets and the LS 400 quickly became America's most popular imported luxury car. The revolution was under way.

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