

BOXING CLEVER

Toyota's new NASCAR Cup racecar has surprised both with the timing of its unveiling and its look. To discover how it came about, **Andrew Charman** speaks to Toyota Racing Development president, David Wilson

Win on Sunday, sell on Monday,' is one of the most recognisable phrases attributed to NASCAR history. It reflects the long and close involvement in the sport by car manufacturers, and the perceived close relationship, in the eyes of fans, between the cars on the track and those in the showroom.

The old phrase clearly still has great relevance today, demonstrated succinctly on January 9, press day of the North American International Auto Show. At the event in Detroit Toyota revealed the new Camry road

car that will go on US sale in August – and alongside it the NASCAR version that will debut at Daytona at the end of February.

CAUGHT BY SURPRISE

The reveal of the race Camry caught most NASCAR watchers by surprise. As well as assuming equal star billing with its road sibling, the new car boasts significantly more dramatic looks than its predecessor, particularly at the nose. More importantly perhaps, the Camry is effectively the first

complete change of a car in NASCAR's Generation-6 era.

The Gen-6 car was introduced for the 2013 season, the product of a development process in which the Win on Sunday phrase could have been the guiding mantra. Effectively the Gen-6 was a major update of the 'Car of Tomorrow' launched in 2008. Five years in development, the main aim of the CoT had been to significantly increase safety, but the process also created the most generic-looking machine seen in the history of the sport. While under the



ABOVE & TOP Studio views of the new 2017 NASCAR Toyota Camry, painstakingly designed to be well positioned in the performance 'box' dictated by the rules. Note in particular the more dramatic nose treatment and also the more prominent wheelarches



Photos: Toyota Racing

skin every NASCAR racecar is of similar construction, visually spectators had difficulty distinguishing a CoT Toyota from a Chevrolet, Ford or Dodge, unless they looked at the badge or the decals. In a sport where the fans display manufacturer loyalty to the same degree as driver support, this was clearly an unsatisfactory situation.

With Gen-6, NASCAR addressed the issue. While further safety measures were incorporated, the prime aim was adding more individual manufacturer identity and bringing the look of the racecars back more closely to that of their road car inspiration. Admittedly some of this distinction is still accomplished by means of decals, creating for example different-shape grille representations, but today's NASCAR racecars do boast more obvious physical distinctions, notably on their noses.

David Wilson, president of Toyota Racing Development (TRD) and ultimately responsible for the NASCAR programme, recalls that achieving the Gen-6 project saw unprecedented levels of co-operation between the competing manufacturers – the finished cars were the result of several round table sessions between the manufacturers and NASCAR.

"We all as manufacturers want to build more relevancy into our racecars, so the challenge for the sanctioning body is to support that while still achieving

aerodynamic parity between the three manufacturers," Wilson tells Race Tech. "Ultimately the manufacturers sat down and worked together to develop a proposal to put in front of NASCAR. We started with deciding which elements of the car we had a licence to change and to build our styles into – specific body panels on the racecar are frozen and common to all. What has resulted is effectively a box, with parameters of drag, downforce and side force. Essentially you now have to be somewhere within that box of performance."

FROM ROAD TO RACE

Toyota's Gen-6 specification was modified for the 2015 season, following a refresh of the road car. But some six months before the 2015 racecar debuted, work had started on the programme that would produce the 2017 car.

"The 2017 production Camry is a ground-up new car incorporating the TNGA architecture that Toyota is implementing across its range. The design concept for that car was produced in late 2014, and ▶



ABOVE David Wilson, president of Toyota Racing Development, has taken overall charge of developing the new Camry for NASCAR competition



ABOVE The new Camry has immediately gone into pre-season testing, here in the hands of Matt Kenseth at Las Vegas Motor Speedway

that's when work started on the racecar," Wilson says.

He adds that starting so early on a programme is completely unprecedented, and represented one of the most challenging aspects of the project. But it was also a critical decision as Masato Katsumata, Toyota's chief designer of the Camry, had created a radical redesign for the eighth generation of a model that in 19 of the last 20 years has been the best-selling car in America.

YEAR-LONG SECRET

The aggressive looks and major step in the styling of the new Camry persuaded Toyota to put the car on the racetrack some six months ahead of its showroom launch, but a target of unveiling both cars in Detroit in January 2017 required keeping the project confidential for more than a year. "The correlation is so close to the street car that if photos or images of our racecar had got out to the general public it would have compromised the launch of the production car," says Wilson.

This became all the more critical when Toyota made its race team partners aware of the project in January 2016, a full year ahead of the debut. "By that time we had a fair idea of where we were heading with the car, but we had to ask all of the teams to have their members sign Non-Disclosure Agreements.

"It wasn't heavy-handed, it was to underscore the sensitivity of the project. They appreciated that and they also thought it was pretty special that we had asked them to participate at that stage, somewhat earlier than with the past two iterations of the car. We made a conscious decision to bring them in earlier, to have their aerodynamicists work shoulder to shoulder with us at TRD as ultimately we knew this would help us get a better start once we were ready to race."

As well as the teams, TRD worked alongside Caltly Design Research Inc, Toyota's North American exterior design studio. The two

and going through this exercise a couple more times, we've been able to refine it."

TRD knew what it was aiming for with the car's aerodynamic performance – seeking the figures that put its car within the NASCAR 'box', effectively matching the aero performance of the current Camry. But before that process could begin the look of the car had to be decided. "The box doesn't change for us, we have to kind of work backwards to that solution. At TRD we have aerodynamicists and CFD engineers, but we don't have stylists – we rely first on the same stylists that designed the production car to

“ You can do a lot of predictive analysis, CFD and in the wind tunnel, but there is a certain amount of holding your breath”

have produced several past NASCAR projects for Toyota, notably the first Gen-6 car, the update to this model in 2015, the 2015 Camry for the second-division Xfinity Series and the 2014 Tundra competing in the Camping World Truck Series.

"As racers our priority is to build a car that can be competitive, to perform on the racetrack, and you can take some liberties relative to the styling, go out of bounds of the styling on the production car," suggests Wilson. "Some of this wasn't that thought out so much when we first did this in 2013. Having a couple of data points to work from,

come up with the racecar," explains Wilson. "And what's really cool about it is they did that as they were completing the styling of the production vehicle. On some level it can only affect their eye, the way they look at design, it's a neat side effect of the process."

It was also considered important to ensure NASCAR was on board with the direction in which Toyota was going. In April 2016 representatives of the sanctioning body were welcomed to a design studio in the TRD technical centre in Ann Arbor, Michigan, where they were able to review a 40 per cent scale model of the new



ABOVE & BELOW The NASCAR Camry taking shape in CAD



car. "The intent was to show them a real model of the production car juxtaposed against our design for the racecar and to make sure we were honouring the spirit of the Gen-6 concept."

Meanwhile the aero development continued apace, with Toyota's teams adding their input – TRD has its own aerodynamicists working on a day-to-day basis alongside the in-house staff at lead team Joe Gibbs Racing. "The lines on the engineering side are blurred between TRD and JGR – we work collectively on our goals," he says.

SUPER-AGGRESSIVE NOSE

The most notable aspect of the 2017 Camry is the nose, which Wilson describes as "much more three-dimensional, super aggressive" in the spirit of being consistent with the styling of the production car. In the process it also presented a much more complex aerodynamic issue: "We had to make some changes and adjustments on the aero side, some of the front fascia on the production car goes deeper than what we employ on the racecar – we have to balance styling against performance.

"You don't want to create pockets of ▶



ABOVE The 2017 NASCAR Camry compared with its road sibling. While the vast majority of the grille area on the racecar is represented by decals, it still looks a great deal more three-dimensional than its predecessor

BELOW Toyota entered NASCAR in 2007 but not until 2015 did Kyle Busch claim the drivers' championship, here celebrating at Homestead. Last season Toyota added the manufacturers' crown to its trophy room, taking its Cup race wins to 95 over 10 years

Nigel Kinrade/LAT for NASCAR



drag or pressure differentials – when our colleagues at Ford made their first change to the Gen-6 car, rolled out in 2015, it was to a very pronounced area of the nose that had become a trash collector. It was an area of low pressure that proved a magnet to hot dog wrappers, blocking the radiator grille.

“You can do a lot of predictive analysis, CFD and in the wind tunnel, but there is a certain amount of holding your breath and getting to the racetrack, analysing the performance of one car, with five or six or with 40 cars,” Wilson says.

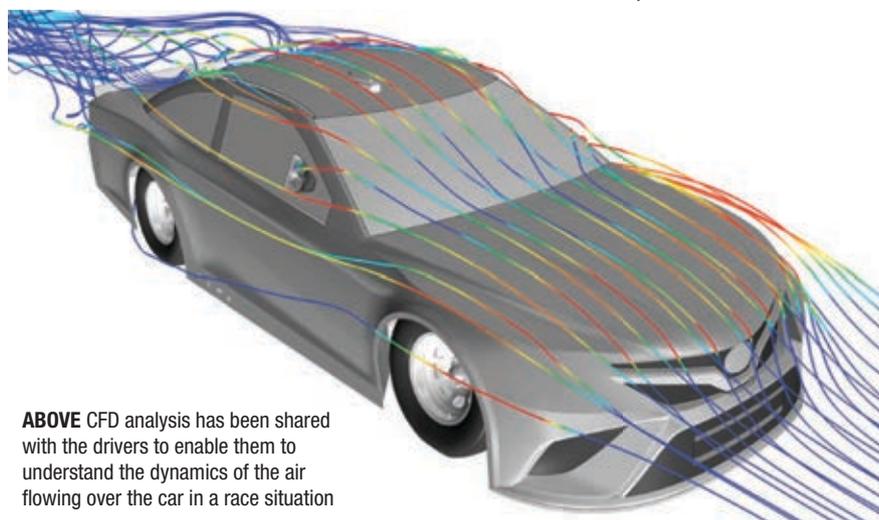
However he adds that CFD studies focusing on two, three or four cars and moving them around has produced usefully accurate analysis of the air around the cars: “It’s really been effective – we’ve gone so far as to sit down with our drivers, go through the studies with them and help them understand how the air works around the car, how for example pulling up close behind another car’s left-rear quarter panel they might have to be careful because of the effect it has on the air flowing over their car.”

GETTING THE GREEN LIGHT

The crunch point came in July, when the 2017 Camry was put in the wind tunnel for its aerodynamic parameters to gain the approval of NASCAR. “There is a master car run in the tunnel first to validate the numbers, where they are on a given day, and then we run our car and NASCAR

allocates us a certain amount of time to effectively ‘pass’ the test,” explains Wilson.

TRD had been carrying out extensive wind tunnel runs prior to the test to ensure it would comply: “But ideally you want to be in the most favourable corner of that box – with the least drag and highest downforce, but still in the box. The challenge is that the wind tunnel is just a tool and there



ABOVE CFD analysis has been shared with the drivers to enable them to understand the dynamics of the air flowing over the car in a race situation

is variability day to day, week to week – you have to go there with a measure of confidence that you are going to succeed.”

Adding an extra element to the NASCAR test programme was the fact that it was conducted in the presence of rival manufacturers Ford and Chevrolet, part of the overall understanding agreed between the OEMs at the start of the Gen-6 era. “This underscores the level of professional respect and trust that we have amongst ourselves – but it is quite unnatural and counter-intuitive to be standing next to a brand new not just race but production car and two of the first people that see it are your competitors from Ford and Chevrolet – a good six to eight months before we go racing...”

As the development of the car reached its climax, NASCAR was working on its own aero programme, seeking to reduce the downforce of Cup cars in a bid to improve racing. This has been carried out principally through dimensional changes to the splitter, spoiler and radiator pan and according to Wilson has caused few difficulties to the Toyota programme: “It had an effect to some extent because we had to work within parameters that were changing, but we had a pretty good idea of where it would end up – these were bolt-on considerations, with some impact but not a major one.”

REALLY UPSET

Underneath the body, the 2017 Camry remains mechanically identical to the 2016 car, the only changes being NASCAR-mandated safety updates. But many mechanical components will be subject to continual development through the season – those affected by airflow under the body.

“The fans have no idea just how much work is done on the parts of the car they never see,” Wilson says. “We get really upset when one of our cars gets airborne in an accident – all the manufacturers employ photographers with high-speed cameras at every race simply to photograph all the cars. They relish the opportunity when a car gets upside down and we get to see its underpinnings.”

The day after the 2017 Camry Cup car debuted at the Detroit show, it was testing on the 1.5-mile Las Vegas tri-oval, and before the end of January further tests were scheduled at the one-mile Phoenix International Raceway. Wilson admits that

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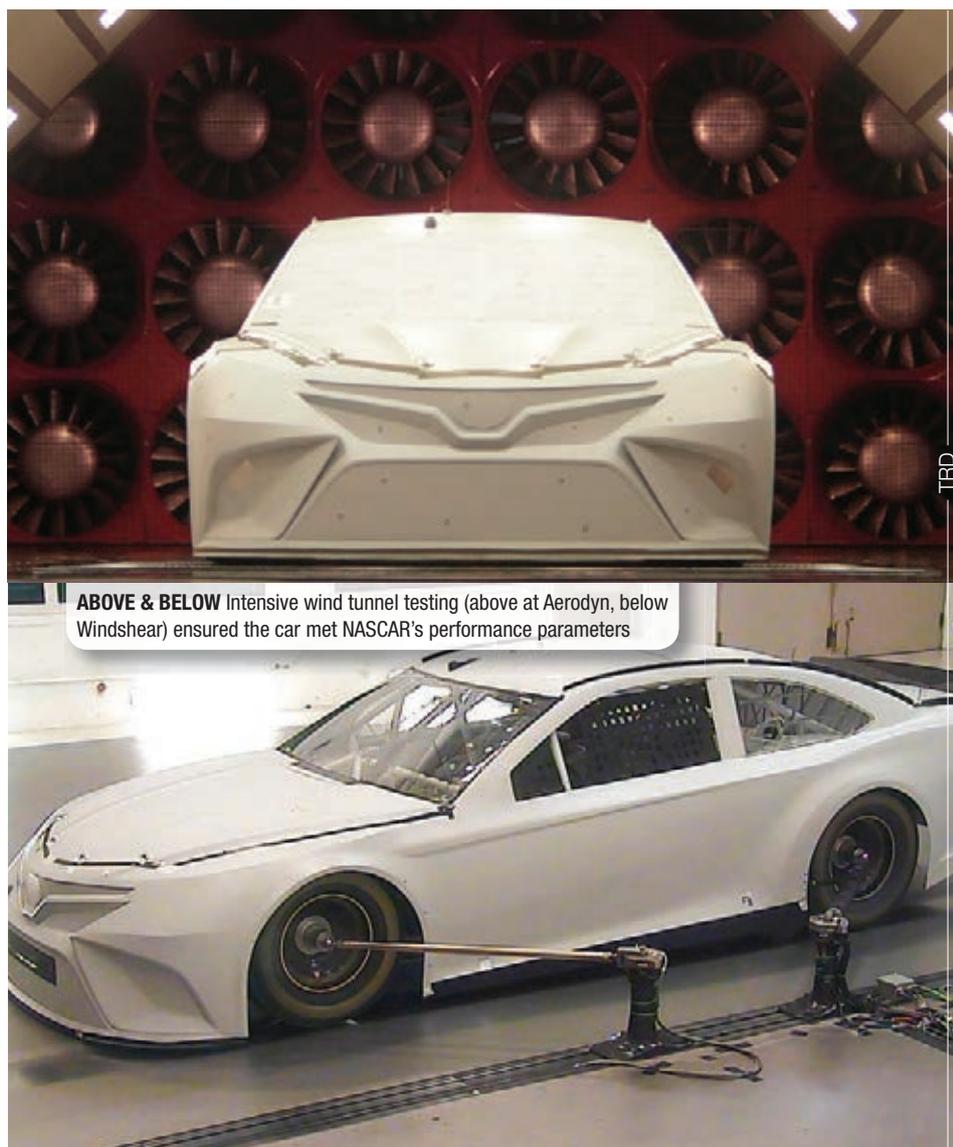
such testing is not that informative: “In a test environment with a track full of cars running various agendas, mainly tyre tests for Goodyear, you don’t really learn a lot about the behaviour of your car in traffic.

“I don’t think we will have a full understanding until we go to Daytona for the first race at the end of February and particularly to Atlanta for round two. The Daytona 500 is a very prestigious race but I’m more concerned about Atlanta as it’s an intermediate track, when you look at how many of those are on the schedule they are our bread and butter.”

The 2016 Camry is now very much history – every Toyota on the Cup grids in 2017 will be wearing the new look. “It’s part of the

commitment and the regulations we signed up for – once we change it has to be across the board. That’s not so easy for some teams who are resource-constrained, but we try and help in that regard with some body parts,” he notes.

By the time the first customers drive their new Camry out of a Toyota showroom in August, the car will already be familiar, with potentially NASCAR Cup wins already to its name. And the pace of development in NASCAR continues – Chevrolet has already announced that it intends to replace its current SS model at the end of 2017. So no doubt David Wilson and his colleagues from Ford will be guests at a very secret wind tunnel session in the summer... **RT**



ABOVE & BELOW Intensive wind tunnel testing (above at Aerodyn, below Windshear) ensured the car met NASCAR's performance parameters